American Machinist

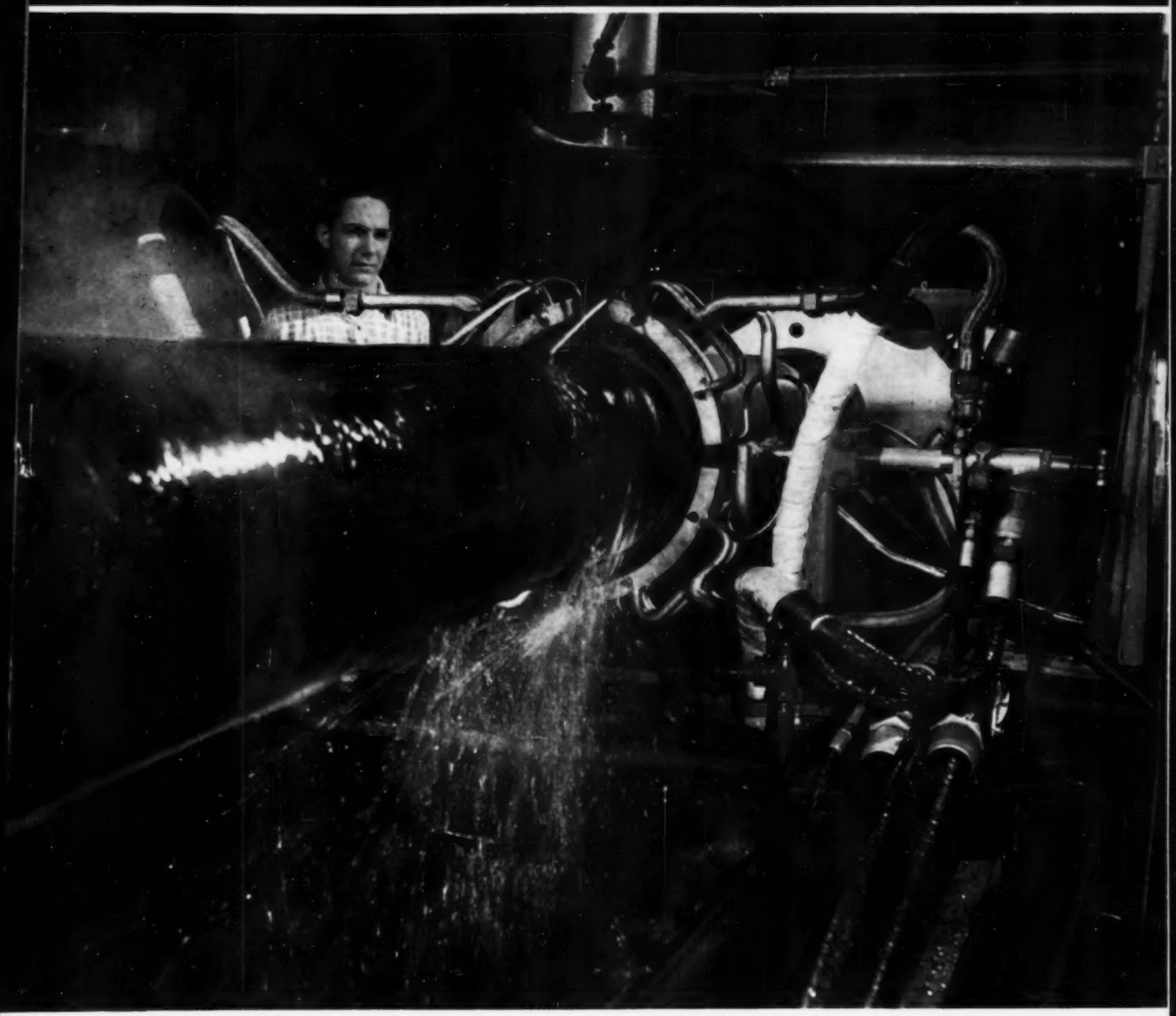
MARCH 23, 1959 75¢

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

DIAMOND WHEELS

Man-made vs Natural

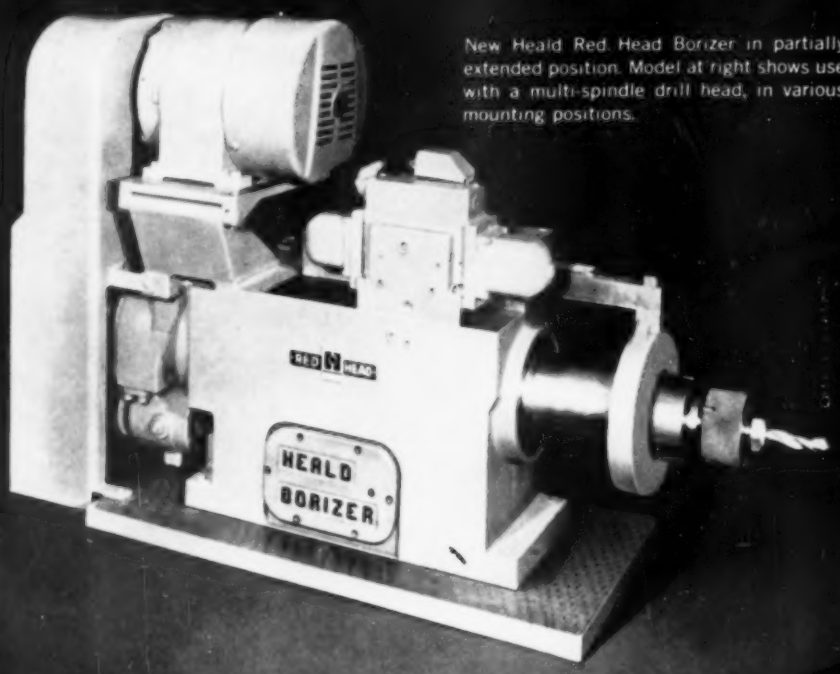
see page 147



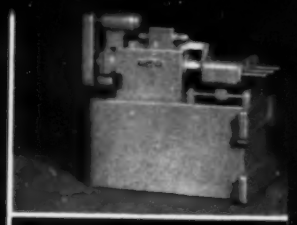
Rolls spin in gas flame and water spray for surface hardening—see page 140

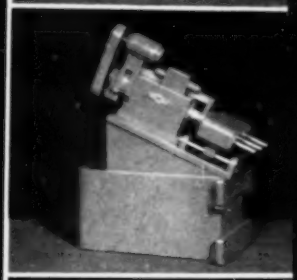
- **What's happening in high-energy forming?** page 125
- **Retooling a dial machine for assembly and inspection,** page 130
- **Brazing with electric blankets,** page 136

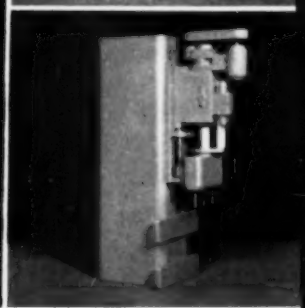
METALWORKING REPORT, page 2

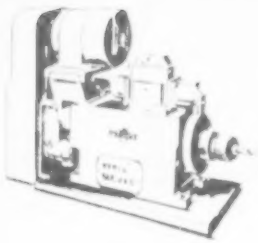


New Heald Red Head Borizer in partially extended position. Model at right shows use with a multi-spindle drill head, in various mounting positions.









Presenting the new Heald

BORIZER

Another **NEW** PRODUCT *by Heald*

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A completely self-contained unit for rotating and feeding single or multiple tools in automated setups

Designed primarily for driving multiple-spindle drill units, it rotates tools and can supply its own hydraulic power. It feeds tools in to the work at any desired rate and rapid traverses out when the operation is done. In short, the new Heald Red Head Borizer can do just about any drilling, reaming, counterboring, chamfering, and plunge facing operations. Under conditions consistent with its design and purpose it is also capable of boring operations similar to those performed on Heald Bore-Matics.

Its compact design permits grouping a number of units in a variety of positions on a single base machine or along an automated line. And its compact, self-contained construction simplifies relocation for job changeovers. Note also that this unit can be mounted horizontally, vertically or at any desired angle.

Heald Red Head Borizers incorporate the basic design and specifications of precision Red Head Boringheads and are available in four sizes, with strokes of 8, 10, 12 or 15 inches. An adequate thrust range is available for multiple drilling operations. Easily accessible dogs control cylinder stroke and adjustable valve gives infinitely variable feed rates within the feed range. The unit may be operated with integral or central hydraulic systems or with integral or centralized electrical controls.

Ask your Heald engineer for further details, or send for a copy of Bulletin No. 5-2, Issue 1.

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TRENDS

Metalworking Report . . 2
Spot News . . 107
Washington . . 109
Detroit . . 111
Aircraft and Missiles . . 113
Machine Tools . . 115
Materials . . 117
What's Ahead . . 119
Field Report . . 208

Departments . . .

Letters . . 98
Calendar . . 101
Editorial . . 123
Talking Shop . . 163
Memos . . 163
Practical Ideas . . 164
New Equipment . . 167
Names . . 243

contents for March 23, 1959

VOLUME 103, NO. 6

New titanium carbide tools outlast ceramics . . . Ford Motor Co's results with new tool material. 125

What's happening in high-energy forming? . . . New data on how the Dynapak is working out. *By S R Carpenter, Convair-San Diego.* 126

Is red tape snarling up U S defense output? . . . Aircraft and missile makers launch attack on outmoded procurement policies. 128

Retooling a dial machine for assembly and inspection . . . Terminal blocks turned out at more than 1500 an hour by an index machine. *By Richard Mueller, Minneapolis-Honeywell Regulator Co.* 130

Hot forming tames "the toughest" . . . Tungsten can be handled by new techniques, for forging, spinning, deep-drawing, and extruding. 132

Better alloys and purer metals from electron-beam furnace . . . More on the possible uses of the new "ray gun" process. 134

Blankets bypass brazing furnace . . . Brazed honeycomb may compete in cost with adhesive bonded because of this new process. 136

The International Inch, II . . . Seven added opinions on what the "new" inch means to U S Metalworking. 137

Induction heater hardens thin-wall parts . . . Selective hardening of two widely separated bearing surfaces at Buick. 139

Rolls spin in flame for surface hardening . . . Progressive spin hardening with natural gas. *By T W Berquist, Ellwood City Forge Co.* 140

Adaptable automation and mechanized lines . . . Stamping, machining, and assembly setups developed to handle mixed production. 142

Comapro reports on machining rates . . . Conclusions based on first 10,000 parts run off at the Cooperative Machining Project. 146

Depreciation Reform . . . Why industry needs a modern tax policy. A message to American Industry from McGraw-Hill. 82

SPECIAL REPORT NUMBER 470

Progress report on man-made diamonds . . . Facts and figures on both laboratory and field tests of wheels made with the new diamonds. 147

REFERENCE BOOK SHEETS

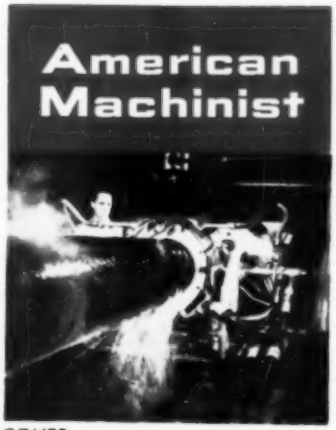
Rate of drill penetration . . . Nomogram to find drill penetration rate when speed and feed are known. *By Tyler G Hicks.* 157

Grinding L-shaped bevels . . . A method to bevel two inner faces to the same angle, no matter what it is. *By Vincent E Califano.* 159

Twist angle of solid shafts . . . A nomogram. *By M M Lachowski.* 161

METALWORKING REPORT

SIGNIFICANT CURRENT DEVELOPMENT IN TOOLING AND PRODUCTION PROCESSES



COVER:
Spin hardening machine at Ellwood City Forge Co uses oxygen and natural gas. Details on page 140.

CUTTING

Man-made vs Natural

With man-made diamonds now plentiful, and natural diamonds now plentiful too, the question is, which to choose? Man-made diamonds cost about 6% more than natural. Evidence to date indicates that in metal-bonded wheels there is no significant difference in efficiency. But in resinoid-bonded cup wheels there is a growing body of evidence indicating greater life for the man-made diamonds. A report on this evidence starts on page 147. Another aspect to consider is that natural diamonds are now available in graded form to meet the competition of the man-made stones (*AM*– Jan 12 '59, p113).

Skin Disease Preventive

With warm weather coming up soon, there is likely to be an increase in the incidence of skin diseases. This makes a recent report by the Industrial Hygiene Foundation of America particularly timely. The report studies the relationship of cutting oils to dermatitis and reports on the factors most likely to cause touble. As a by-product of its study, the Association has prepared a booklet containing tips on how to avoid trouble. The booklet is being distibuted by the American Petroleum Institute and by cutting oil manufacturers. (If you would like one copy of the booklet free, circle No. 50 on the Reader Service Card.) A general study of the subject of cutting oil and dermatitis will be in our next issue.

Ford's New Tool Material

Fine grain titanium carbide tools produced at Ford have been tested in four plants. TiC has been added to tungsten carbide tools to improve cratering resistance, but most attempts at pure TiC have resulted in coarse grains. In five out of six tests in Ford plants, the new tools have outperformed both tungsten carbide and ceramic. See page 135.

Machine Error Compensator

A continuous-path numerical-control system available from Dage Div, Thompson Ramo Wooldridge Inc, (Michigan City, Ind), called DCS system, provides an unusual additional feature. Slight reproducible errors that may be present in the ways or gearing of the controlled machine tool can be minimized by a compensating cam in the feedback system of each axis. This cam automatically neutralizes these reproducible errors to provide somewhat better accuracy than is originally available in the machine tool. It is thought that this ability will assist in adapting the control to conventional machine tools, hence will improve the practicality of retrofitting.

Dial P for Precision

Pratt & Whitney Aircraft, East Hartford, Conn, has just installed two jig boring machines that are positioned by a telephone dial system.

Operators dial desired positions like a telephone number and the electronic measuring system takes over, requiring about 20 sec to position the machine. A visual data panel provides a check of the position dialed. The machines can also be controlled by perforated tape.

Both machines, first of six ordered by Pratt & Whitney Aircraft were built by Pratt & Whitney Tool Co, West Hartford, and are 4ES Electrolimit jig borers.

FORMING

High-strength Roll Forming

Pioneering work in aus-forming, or roll-forming with a heated mandrel, is being done at General Electric Co's Rocket Engine Section (Evendale, Ohio) under a development contract with the Navy. Resulting in yield strengths of 340,000 psi and elongation improved by 10 to 12%, the work has already demonstrated new potential for ultra-high strength components, such as solid propellant rocket cases.

By forming these materials in an austenitic condition, LaBelle HT shows a Bainitic structure after being reduced 65% in a single pass. Halcomb 218 has a Martensitic structure after a single 50% aus-forming reduction. Roll-formed samples are hydrostatically tested, in full size, until they burst. Metallurgical specimens are examined electromicrographically at a magnification of 6000 times, after etching in 5% Nital.

CAUTION

These pages are not a synopsis of this issue of American Machinist. Major articles are described briefly in the Contents page. Because the Trends pages are classified by subject, they are not described anywhere else. Most of the developments in this department are so new that further information is not yet available —when it is, you will find a page reference to the article.

HEAT TREATING

Pure Tungsten Now Worked

Until recently, tungsten parts were made exclusively by powder metallurgy. Now Fansteel Metallurgical Corp, North Chicago, is working the pure metal by a break-through in technology.

The secret of forging, spinning or extruding pure tungsten is to get it hot and work it fast before the metal temperature gets below the plastic range. Fansteel starts working tungsten slugs at about 3000 F, stops and reheats when the temperature drops below 1470 F, or so.

Reheating causes a loss in ductility.

So a final working of the piece is required to rebuild required strength.

Hot extrusion of pure tungsten to a total reduction in area of 70% has been achieved. Engineers at Fansteel think the extruded tube can be used for drawing thinner-walled tubing or be upset to a special shape. Further details on page 132.

Flame Harden With Natural Gas

Instead of supplying its progressive spin hardening machine with the usual oxygen-methane fuel mixture, the Ellwood City Forge Co, Ellwood City, Pa, substitutes natural gas for methane and feeds the burners directly with an oxygen-natural gas mixture. Flame temperature is in excess of 2000 F, high enough for even the deepest flame hardening job. Coming directly from the service main, natural gas eliminates the need for a tank farm, delivery, and inventory.

INSPECTION

Flatness Check for Large Areas

A simple, sensitive interferometer for testing the flatness of large surfaces has been developed by the National Bureau of Standards, Washington. This instrument can be used to determine the flatness and regularity of large surface plates as used in production of aircraft components, precision parts, tools, gages and fixtures.

The instrument examines surfaces by producing a series of interference fringes, which in effect constitute a contour map of the area. With a suitable light source and angle of incidence, an observer can estimate deviations from flatness to approximately 0.00001 in.

Looks Inside Opaque Bodies

An infra-red microscope that can be used for visual examination of materials has been developed in Russia. Instruments capable of 100 to 600 magnifications are feasible. And they can be focussed upon any required depth in the opaque specimen under study.

By using such an instrument it is possible to investigate the structural homogeneity and purity of materials that are transparent to infra-red rays. Reports indicate that specimens ranging from several microns to several millimeters in thickness can be studied.

Mikes to Ten-Millionths

Super - accurate micrometers (± 0.000010 in. per in.) are now being made by Sheffield Corp, Dayton, for use by gage, instrument and precision-parts makers. Two standard size ranges now available are: 0-1 in. and 0-2 in.

The micrometers have a 4-in. barrel for ease of reading. Readings on thimble and barrel can be arranged for right or left, normal or reverse. Leadscrew, nut and barrel are calibrated as a unit by the Eli Whitney Metrology Laboratory.

THE OUTLOOK

Upswing in appliances, farm machiney and raiload equipment, on top of increased auto schedules since Januay 1, gives metalworking poduction a stability at relatively high levels. Output will stay where it is or go up further in the weeks ahead. See page 119.

WELDING

Biggest Honeycomb Panel Yet

New techniques and new materials are being combined to produce larger honeycomb panels than any previously fabricated. North American Aviation needs them for its B-70, is now working on a 10 x 14-ft steel honeycomb made possible by US Steel's wide-sheet-rolling program. The program, under AMC contract, was moved up a year because of the need for these wide skin sheets.

Present methods call for furnace brazing in an electric retort where graphite molds act as contour fixtures to keep the structure in shape. In the future, brazing will also be done by a new technique which involves electric-blanket heating.

Others interested in electric blankets are Rhor Aircraft and Electrofilm, Inc. They claim much lower costs, less time, less space, greater flexibility, and the ability to handle any sizes or special shapes. The blanket replaces the furnace completely, can be used anywhere in the plant. See page 136.

Spiral Tube Welding

A new technique for making pipe and tubing wraps stripstock around a mandrel and welds the spiral so fast it can produce 3-in. tinplate tubing at 60 to 70 ft per min.

Size of tube is changed simply by changing the mandrel so strip is fed at different helix angle, and the spiral weld strengthens the tube, permits thinner material.

Developed by New Rochelle Tool Corp, New Rochelle, NY, the process employs the company's high-frequency resistance welding equipment which operates in the neighborhood of 450,000 cps. Heat is concentrated at edges of material as it comes together to be welded.

Honeycomb-skin Welding

New continuous welding process joins sheet skins to honeycomb cores, making panels up to six times as strong as brazed panels, and as much as 50% lighter. The Grimland Process can be applied to one or both sides of the panel, simultaneously if desired. Test sections built so far have been high-strength stainless steel.

Cost is reduced because close tolerances, usually demanded for brazed panels, are not required. Honeycomb edges do not have to be tabbed or flanged for good results—in fact, the weld can be from partial to 100% as desired, which allows built-in flexural properties in the panels.

Contoured parts of various thicknesses can be joined. Weld pattern is controlled automatically by sensing devices that also inspect results. Process has been announced by Grimland Co, Marietta, Ga.

ASSEMBLY

Rivet for Lower Fatigue

Fatigue failures can be sharply reduced, according to the Society for Experimental Stress Analysis, if lap rivet joints are made so rivets take two kinds of load independently. Rivets near the center of the lap can take conventional shear loads. But extra rivets located so they center at each end of the lap will take bending moment, and will reduce bend as the joint is stressed under tension.

At lap ends, the extra rivets cannot take shear because they are partly exposed; but the heads will pull the lap together. Fatigue tests showed an increase of fatigue life from 10,000 to 248,000 cycles because lap-end rivets that carry no shear were added.

FINISHING

Vibratory Finisher

A new principle of cleaning and deburring that outperforms barrel tumbling by as much as 100 to 1 has been developed by Lord Chemical Corp,

York, Pa. Parts, media, and compound are loaded into an open container which is subjected to three-way vibration that produces rotary motion of the load. The resultant scrubbing action can be varied in intensity by controlling the rate of vibration and the type of media. Internal surfaces are treated as fast and effectively as external surfaces.

The original equipment was built for batch processing, but continuous machines are now available into which work may be delivered as a continuous stream from the production machines. At the conclusion of their time cycle, parts leave the vibrator at the same rate as that at which they are supplied, thus producing a continuous flow of finished work.

Unique feature of the process is that there is no tangling or distortion of even the most delicate parts, yet heavy forgings and castings can be processed with equal ease.

Variable, Automatic Barrel Plater

Known as the VIP machine, a new concept of automatic barrel processing has been introduced by Udylite Corp. It is designed for service along I-beam monorails, using standard barrels and self-contained automatic units. Each cylinder and carriage assembly has its own motor, speed reducer and clutch, operated from a single control center equipped with adjustable timers for completely automatic operation.

Depending on the work to be performed: cleaning, rinsing, pickling, plating, phosphating, or other similar process, each unit may be adjusted for up or down dwell, delayed set-down, advanced lift, or skip. Work may be handled in conventional rotating barrels, oscillating trays, or perforated boxes.

Each unit consists of a frame hung parallel to the monorail and carrying the motor, gearbox, clutch, rack-and-pinion hoist, barrel, barrel hanger, and self-cleaning bus connector. A typical cycle would involve lowering the barrel into the tank and rotating it at 6 rpm—or other desired speed—for the necessary dwell time, then raising it slowly, still rotating, to the up position where rotation stops. The unit is then ready for movement to the next station. By changes in the drive, rotation may be stopped, or operated intermittently for such operations as dichromating.

The VIP will handle up to 250 lb of work per cylinder, with a bus rated at 1000 amp. Several different processes may be run simultaneously as the operator selects them on the control panel.

MATERIAL HANDLING

Structural-Steel Handling

A mechanized handling system for huge structural-steel pieces, said to be the first of its kind in North America, has recently been installed in a Canadian plant. Motorized conveyors and transfer skids carry I-beams and column sections through four operations—sawing, two drilling, blast-cleaning—in one continuous process. Installed in the Mount Dennis (Toronto) plant of Dominion Bridge Co, Ltd, the system eliminates conventional between-machines handling. Conveyor speeds of up to 20 fpm are available.

The system incorporates a novel method of measuring for cutting and for spacing of holes. Synchronized with the motorized conveyor rollers is a calibrated dial in plain view of the operator. As the piece being processed moves through the machine, the dial continuously registers the distance traveled, with accuracy to 1/16 in.

Layout of machines and conveyors permits any operation to be bypassed if not required.

MATERIALS & COMPONENTS

Cast aluminum bar

"K-slab" cast-aluminum bar, the result of two years of research and development in continuous-strip casting methods at the Chalmette, La, plant of Kaiser Aluminum & Chemical Corp, is showing substantial savings.

Although the material has proved most beneficial as bus bar in Kaiser's own plants, with three million pounds used to supply cathodes and anodes on the first two potlines in the new Ravenswood, W Va plant and one-and-one-half million pounds in the ninth potline at Chalmette, it has other uses. K-slab bar can be formed with a press brake and does not crack or spall when bent 90 degrees at a flat radius of $1\frac{1}{4}$ times thickness. It has a tensile and compression strength of 10,000 psi and a shear strength of 4300 psi. K-slab is also used to prepare stamped slugs for use in impact extrusion. No special equipment is required for bus fabrication.

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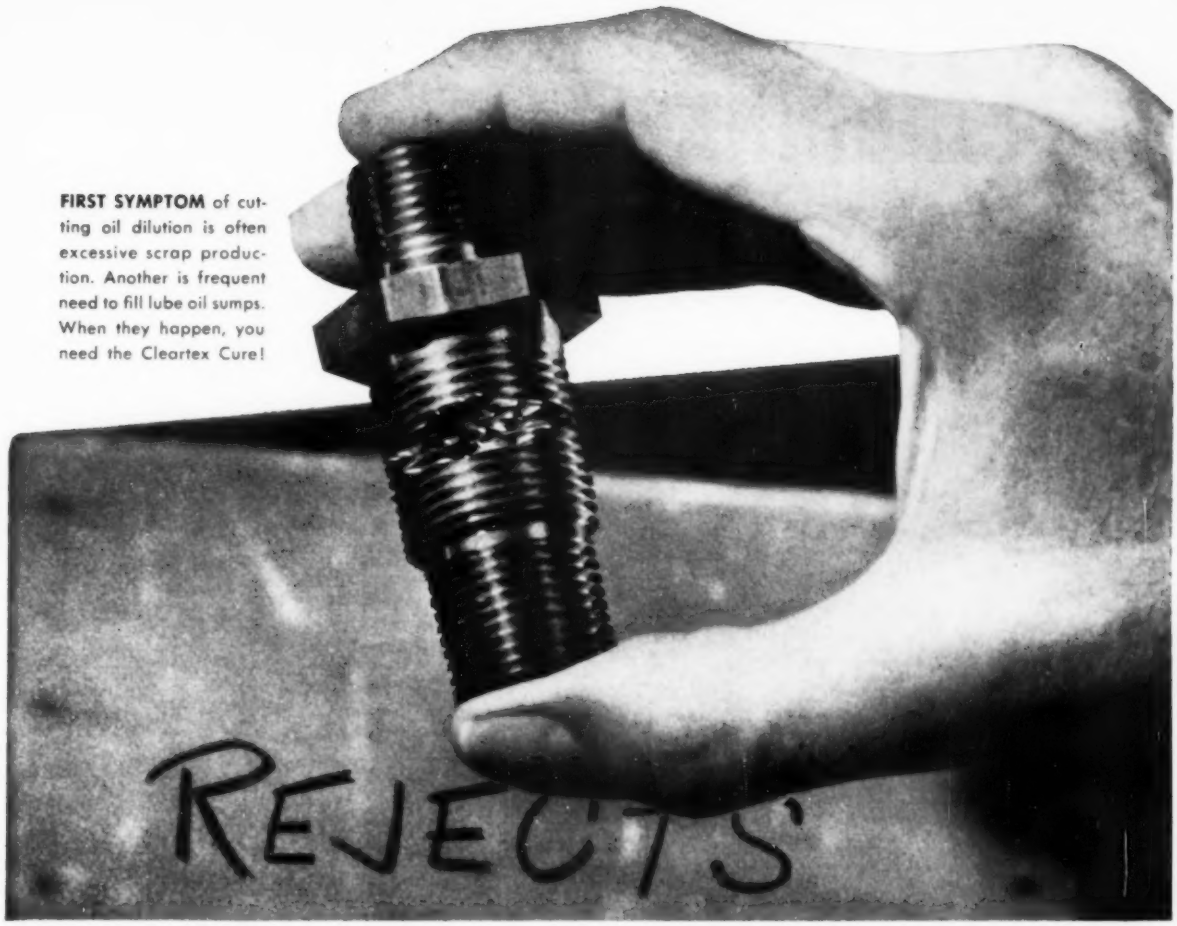

FIRST SYMPTOM of cutting oil dilution is often excessive scrap production. Another is frequent need to fill lube oil sumps. When they happen, you need the Cleartex Cure!

Diluted cutting oil can pile up rejects

When you find your scrap production soaring, the villain may be lube oil leaking into the cutting oil sumps of your automatic screw machines. It happens in 7 out of 10 automatics in spite of the most careful lubricating techniques. This dilution will lower cutting oil effectiveness—and, as it loses its efficiency, rejects pile up, tool life drops, and production can go down by as much as 33 per cent!

Texaco Cleartex can solve the problem—forever!
Because of its exceptional stability and load-carrying ability, Cleartex can function *both* as a cutting oil *and* as a lubricant —and even as a hydraulic fluid. When *all* your automatics' sumps are filled with Cleartex, unavoidable leakage is no longer a problem. Excessive scrap production will stop, tools will last longer and production will go up.

TAKE THE "CLEARTEX CURE" SOON!
Write today for your copy of Texaco's new booklet—"Cleartex in Automatic Screw Machines." This new illustrated guide will fill you in on the details, show you where you may be losing profits and how to avoid it. Or contact your local Texaco Lubrication Engineer for an authoritative survey of your automatics. Just call the nearest of the more than 2,000 Texaco Distributing Plants, or write:

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LUBRICATION IS A MAJOR FACTOR IN COST CONTROL

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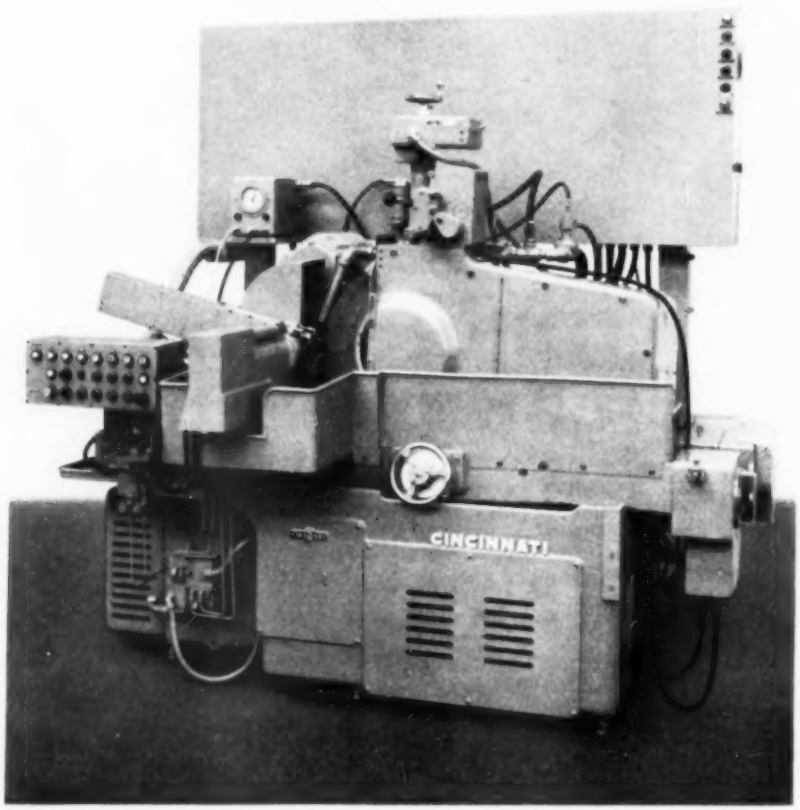
CINCINNATI COMBINES

SUPERIOR CHUCKING GRINDER PERFORMANCE

with WIDE VARIETY OF TOOLING

FILMATIC



Production and quality are automatically controlled by the ingenious tooling and extra equipment, principally of standard design, on this CINCINNATI FILMATIC No. 2 Chucking Grinder. These fine precision grinders are built in two sizes:

No. 1—Capacity 0" to 4" diam.
No. 2—Capacity 2" to 10" diam.
Catalog No. G-685

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CENTERTYPE GRINDING MACHINES • CENTERLESS
MICRO-CENTRIC GRINDING MACHINES • CHUCKING

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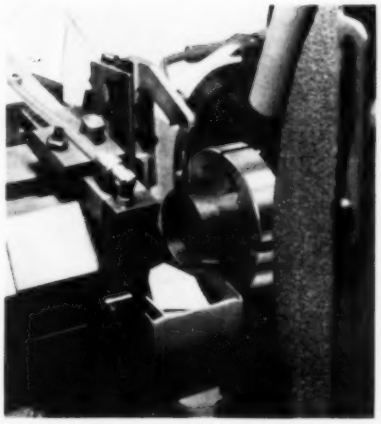
The chucking method of grinding is not always well defined. But Cincinnati Grinding Specialists know exactly when it should be applied . . . they have the opportunity to weigh it against the centertype and centerless methods. In shops throughout the country, manufacturing lots of several hundred or millions can be ground at the lowest cost on CINCINNATI FILMATIC Chucking Grinders.

These fine precision grinding machines are built with single-spindle or two-spindle headstock, and can readily be tooled up with a wide range of positive chucking and work locating arrangements including manual or push-button profile truing; automatic cross feed compensation; crush truing; automatic gap eliminator; automatic air-electric gage sizing. Many additional items of tooling, even for unique grinding applications, are available as "standard" extra equipment.

Of course, the machine itself incorporates many feature-advantages of long productive life and accurate performance, such as FILMATIC grinding wheel spindle bearings; variable-angle headstock positioning; extra sensitive automatic dual rate infeed; two-speed cross slide handwheel; super-accurate headstock spindles. **No longer is it necessary to grind on dead centers to obtain a high degree of accuracy.**

Three examples of the type of work performed by CINCINNATI FILMATIC Chucking Grinders are illustrated here. Many more, and complete specifications for the machine, are in catalog No. G-685. Write for your copy.

CINCINNATI

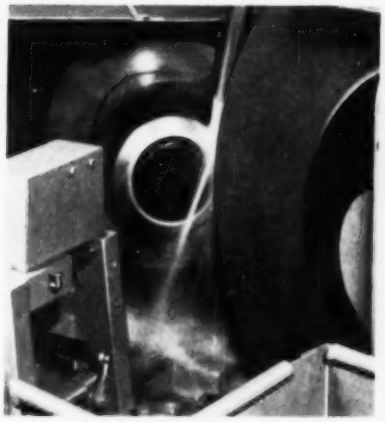


Single spindle, automatic production including air-electric gage sizing, cross slide compensation, automatic loading, etc. Heavy line in part drawing indicates ground surface.

Part name .....Clutch race
Operation .....Grind O.D.
Material .....Steel
Production .....192 per hour

Two-spindle headstock, pneumatic diaphragm chucks, automatic truing, manual loading. Finished ground part is shown in foreground. Heavy line in part drawing indicates ground surface.

Part name .....Transmission gear
Operation .....Grind face
Material .....Steel
Production .....94 per hour



Single spindle heavy duty headstock, automatic grinding cycle, pneumatic chuck with interchangeable jaws for 13 sizes of parts. Heavy line in part drawing indicates ground surface.

Part name .....Valve core
Operation .....Grind radius on seat
Material .....Stellite hard facing
Production .....20 to 35 per hour, depending upon size

GRINDING MACHINES • ROLL GRINDING MACHINES
GRINDERS • CENTERLESS LAPPING MACHINES

GRINDING MACHINE DIVISION
The Cincinnati Milling Machine Co.
Cincinnati 9, Ohio

CIRCLE 173 READER SERVICE CARD

Accurate, High-Speed **GEAR** at

58-tooth gear, 11 N.D.P., 17° 49′ helix, 2″ face width.
Grinding allowance: 0.014″ over pins.
Material: 4140 steel, 245-285 Brinell hardness
Grinding time: 15 minutes.

14-tooth pinion, 11 N.D.P., 17° 49′ helix, 2½″ face width for full depth teeth.
Grinding allowance: 0.012″ over pins.
Material: 4140 steel, 269-321 Brinell hardness
Grinding time: 8 minutes.

Tolerances:
Lead—0.0001″ per inch.
P.D. runout—0.0005″ T.I.R.
Involute profile—plus 0.000, minus 0.0002″.

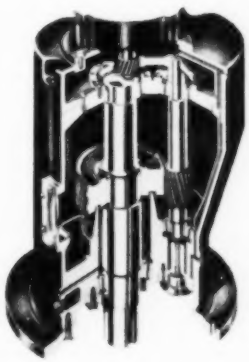
Reishauer Gear Grinding Machine

THE PRECISION LINE

Fellows

GRINDING

PHILADELPHIA GEAR



When speed reducer gears need that extra degree of precision for smoother, quieter operation, the well-known Philadelphia Gear Works grinds them on a Reishauer because it is accurate and fast. For example, grinding time was only 15 minutes for the gear and 8 minutes for the pinion shown on the opposite page.

Gear grinding by the Reishauer method is a generating process. The involute gear teeth are generated by a grinding wheel on which a helix has been developed. The tooth section of the wheel is usually that of the basic involute rack.

Fellows builds the No. 12 Fellows-Reishauer Gear Grinding Machine under license from Switzerland's Reishauer Tool Works. The No. 12 grinds in both directions of travel of the work-slide and has a built-in device for crown grinding. Short set-up time permits the economical production of single pieces as well as long runs.

Capacities for the No. 12 are: Max. O.D., spur and helical, 12"; Max. face width, *spur*, 6¾"; Max. face width, *helical*, depends on pitch and helix angle; Pressure angles, 14½° to 30°; Pitch ranges (two lead screws are available), 6 to 48 D.P. or 20 to 120 D.P.

Grinding gears by the Reishauer method will give you precision gears at real production speeds. Ask your Fellows Representative about it.

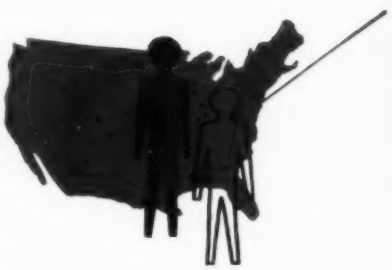
THE FELLOWS GEAR SHAPER COMPANY
78 River Street, Springfield, Vermont
Branch Offices: 1048 North Woodward Avenue, Royal Oak, Mich.
150 West Pleasant Avenue, Maywood, N. J.
5835 West North Avenue, Chicago 39
6214 West Manchester Avenue, Los Angeles 45

Gear Production Equipment

There is a Threading Specialist IN YOUR SHOP

He is your Landis Service Representative. Although not in your plant every minute of every day, a phone call or wire will bring him to you promptly. Down time, improper chaser life, failure to meet specifications . . . these are the types of problems your Landis Service Man helps you to avoid.

These Service Representatives, located throughout the country, can help you in many ways. For example, they can show you how to best use your threading equipment (whether the operation is by cutting, grinding, tapping, or rolling) to save you time and money. They will aid in translating the general sales literature data into specific information on producing your particular threading job. They can describe the special equipment that has been designed for threading unusual and difficult-to-handle workpieces. By working with our Engineering Department, they are able to provide additional information on similar equipment for your special threading requirements. These are but a few of the many ways the Landis Service Representative can help you.



All LANDIS Equipment is guaranteed to produce threads to meet the degree of accuracy and production for which it is sold. Our extensive staff of Service Men, plus the above guarantee, emphasize the value LANDIS assigns to satisfied customers. We sell performance, not just products, and you become an expert on threading, when our experienced Service Representatives are at your service.

LANDIS *Machine* COMPANY WAYNESBORO • PENNSYLVANIA

THE WORLD'S LARGEST MANUFACTURER OF THREADING EQUIPMENT

Threading Machines

Die Heads - Rotary & Stationary

Taps - Collapsible & Solid Adjustable

Centerless Thread Grinding Machines

Thread Rolling Tools

Thread Rolling Machines

541

CIRCLE 176 READER SERVICE CARD

LAROMACO

new

LANDIS microfeed

. . . a fine feed to final size that guarantees precision to "tenths" tolerances on a **production** basis

The mark for close tolerance production grinding

NEW LANDIS MICROFEED

Here is a new cylindrical grinding feed that overcomes all the limitations of conventional feed systems for this class of work.

New Landis R Plunge Grinder with MICROFEED automatically grinding 3 diameters and face of transmission shafts with dependable accuracy.

Cost saving production advantages of Landis MICROFEED

- automatically compensates for wheel wear and machine temperature variations
- eliminates manual re-adjustments of wheel feed due to wheel and machine variables
- eliminates costly rejects and reworking
- easy to set feed reduces set-up time

LANDIS

precision grinders

LANDIS TOOL COMPANY / WAYNESBORO, PENNSYLVANIA

1200 close-tolerance

with a

VAN NORMAN 2C *DIVERSIMATIC**

CENTERLESS

Back taper and straight shank finished ground in one pass!

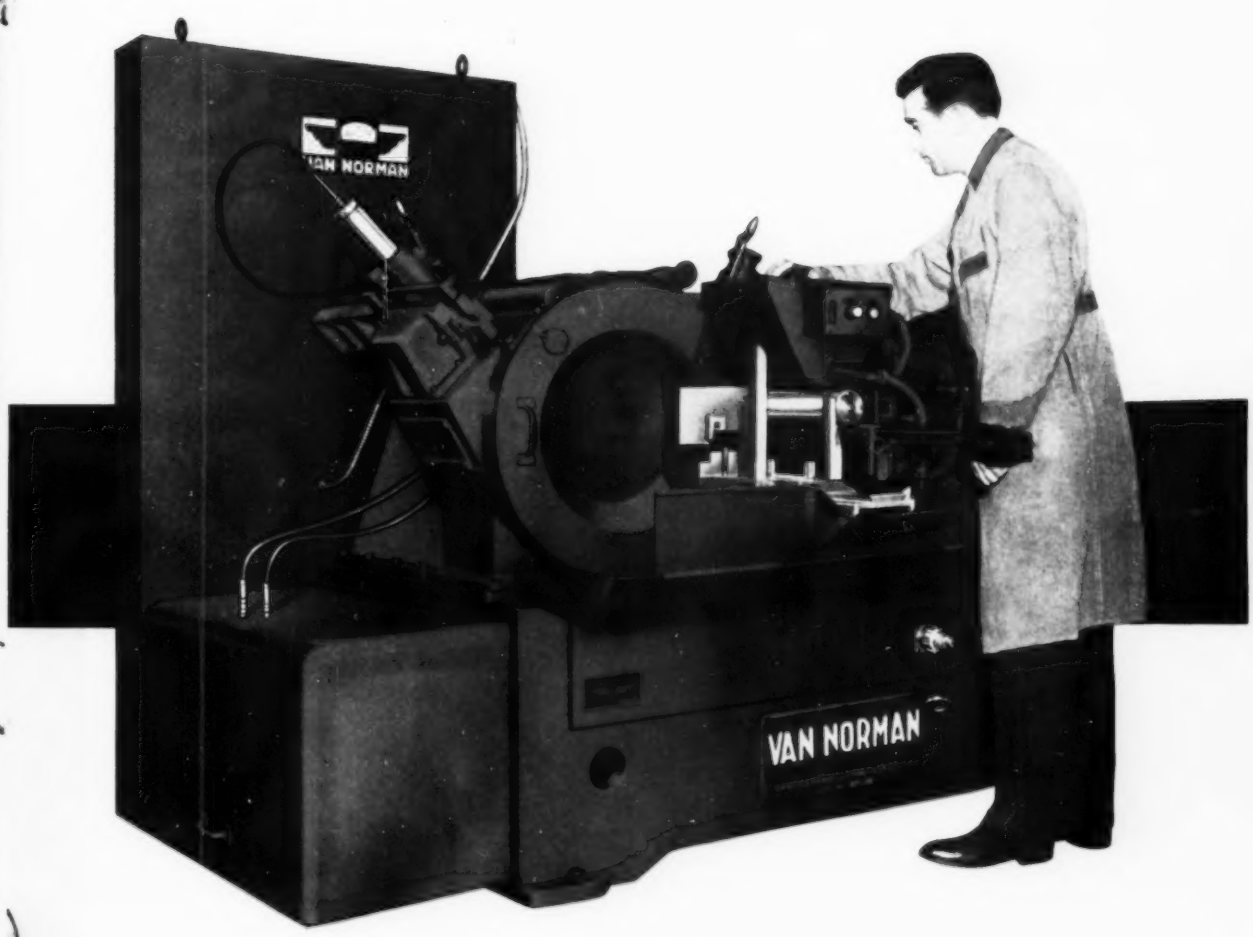
A few of the many close-tolerance parts now being volume-produced by Van Norman Diversimatic Centerless Grinders. Part #1 is made of graphite, #2, glass, #3, plastic, #4, cast iron, #5, Titanium. All other parts shown are steel.

VAN NORMAN MACHINE

SPRINGFIELD 7, MASSACHUSETTS

MANUFACTURERS OF — Ram and Column Type Milling Machines, Cylindrical Grinders, Spline and Gear Grinders, Oscillating Radius Grinders, Special Production Grinders, Centerless Grinders.

finished ½" drills per hour—



Using a 2C Diversimatic, with special automatic loading and unloading mechanisms, Morse Twist Drill, one of the country's largest manufacturers of precision twist drills, grinds 1200 high speed ½" twist drills per hour! Stock removal is .006, grinding the back taper and straight shank in one pass, maintaining tolerances of $\frac{+.0005}{-.0000}$.

Morse is but one of many manufacturers who have found that Van Norman 2C Diversimatic Centerless Grinders help them increase production and hold down production costs. Find out now how Van Norman Diversimatic Centerless Grinders can help you with your volume-production problems — write, wire or phone now for more information.

NOTE: The Van Norman 2C Diversimatic Centerless can be equipped with the exclusive Van Norman crush-former which greatly increases the range of close-tolerance parts you can volume-produce.

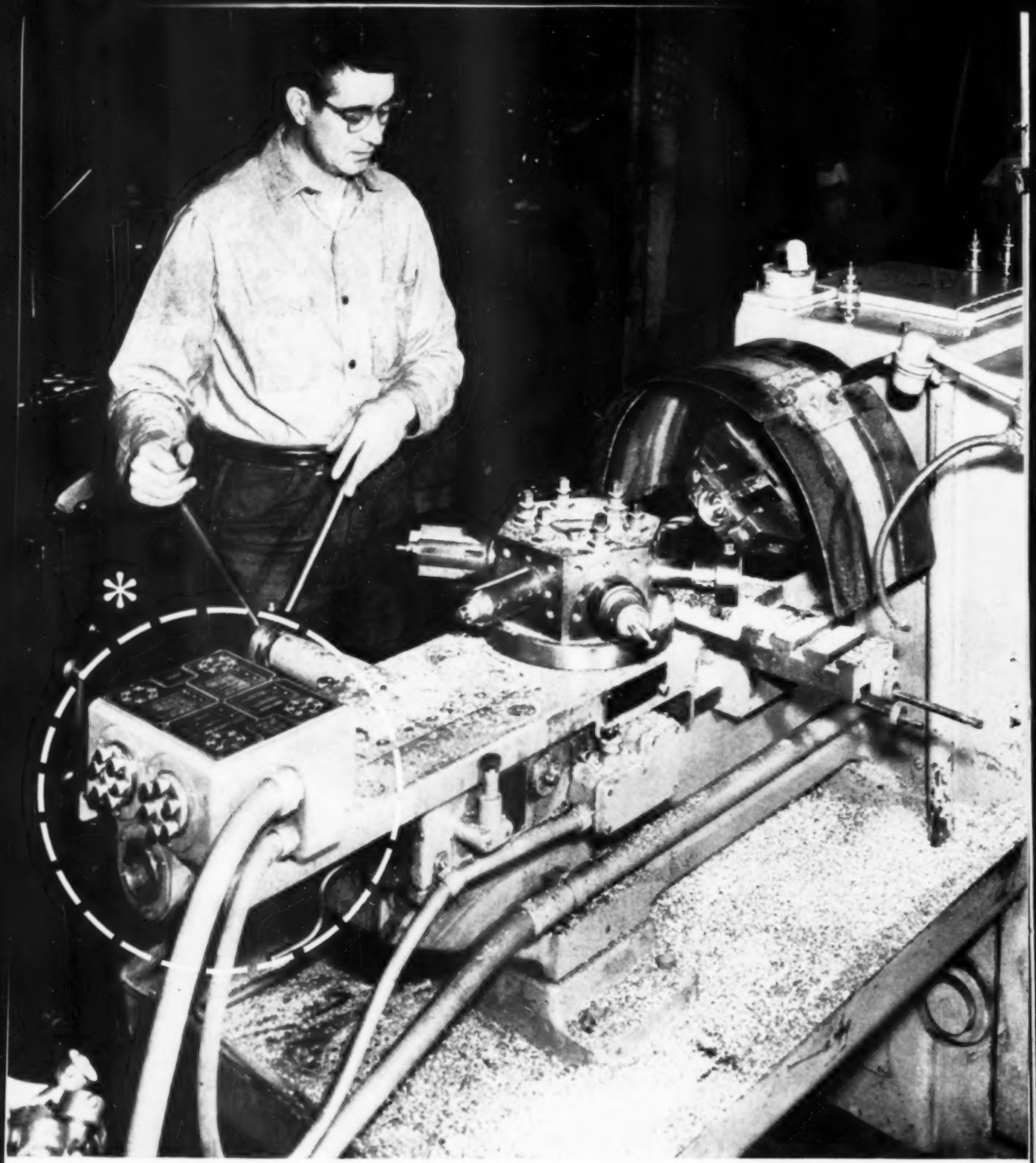
COMPANY
A DIVISION OF
VAN NORMAN INDUSTRIES, INCORPORATED

VN

Don't wait . . . for extra profit install a Van Norman machine now!
They are available in many purchase plans . . . Outright sale . . .
Purchase on conditional sales contract up to five years . . .
Pay as you depreciate up to 10 years.
Conditional Sales Contracts not available to Export.

*T.M. Reg. U. S. Pat. Off.

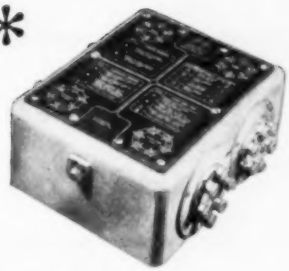
CIRCLE 181 READER SERVICE CARD



Here's the electric "brain" of the versatile Warner & Swasey 16" Electro-Cycle. Your operator merely selects the required spindle function for each turret face —start, stop, reverse and speed—by simply presetting the control drum buttons. Correct spindle functions are then actuated at the right time—much faster than could be accomplished by manual operation. And it never forgets.

CIRCLE 182 READER SERVICE CARD

At Anderson Electric Corporation...



Electric "Brain"

on Warner & Swasey 16" Electro-Cycle® Turret Lathe

- **AUTOMATICALLY COMMANDS ALL SPINDLE FUNCTIONS**
- **REDUCES MACHINE HANDLING TIME**
- **INCREASES PRODUCTION 50%**

Installation of Anderson Electric's new 16" Electro-Cycle enabled them to eliminate all third-shift operation on two turret lathes formerly required to maintain production schedules!

This progressive Birmingham, Alabama, manufacturer of electrical connectors and fittings especially like their Electro-Cycle's:

- **Fast Setup—especially valuable on small lot production (10 to 1000 pieces)**
- **Unique Spindle Positioner that stops the chuck at the same place—ideal for establishing time-saving loading and unloading rhythm**
- **Tolerance Holding Ability—.002 inch total**
- **Automatic Spindle Reverse for accurate threading—fast, easy tap and die removal**

In production shops everywhere, the 16" Electro-Cycle is busy cutting costs, reducing workpiece and machine handling time, and lessening operator fatigue. That's because it was specially designed by Warner & Swasey engineers for machining non-ferrous materials such as—brass, bronze, aluminum, magnesium, hard rubber and plastics.

Contact your Warner & Swasey Field Representative and see how this versatile turret lathe can make your non-ferrous jobs more profitable.

®Reg. U.S. Pat. Off.

WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880

YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS...WITH A WARNER & SWASEY

Now—FINISH FLAT

New Norton 6" x 18" Surface Grinder Ready For Immediate Delivery

You FINISH FLAT FASTER with the new Type S-3 hydraulic which is equally efficient for long production runs or a wide variety of toolroom grinding because of its new cost-cutting features. It produces plane surfaces smoothly — with automatic or manual cross feed and with such fast, cool-running action that it saves time and money on every job.

Ask your Norton Representative for the whole story. Or write us direct for Catalog 2128. And remember: only Norton Company offers you such long experience in both grinding machines and grinding wheels to bring the "Touch of Gold" that helps you produce more at lower cost. NORTON COMPANY, Machine Division, Worcester 6, Massachusetts.

Profit from these benefits

1. Get Jobs Done Fast and Cool — high table speed, *125 feet per minute, maximum.* **2. Handle Tall Work Pieces** — greater vertical capacity, *15"*. **3. Get Lasting Accuracy** with guide-rail cross slide construction. **4. Control Vertical Feed Accurately and Position Fast** with two-speed .0001" increment hand wheel. **5. Benefit from Better Sighting and Loading** due to contoured splash guards. **6. True Forms, Even on Worn Wheels** because of recessed wheel spindle housing.

To Economize, Modernize with **NEW**

NORTON

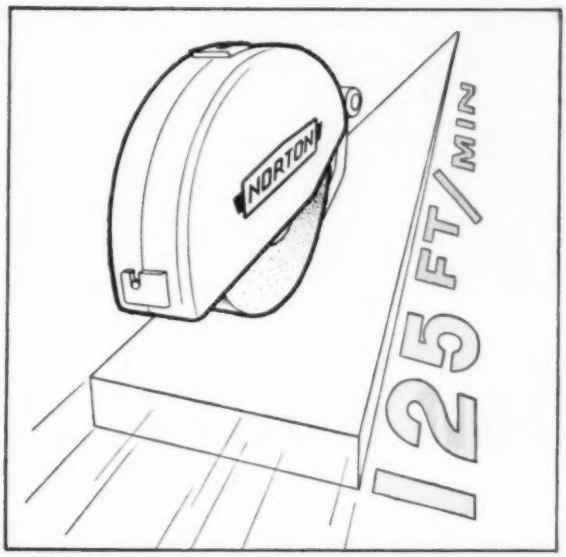
GRINDERS and LAPPERS

Making better products... to make your products better

NORTON PRODUCTS
Abrasives • Grinding Wheels • Grinding Machines
Refractories • Electrochemicals
BEHR-MANNING DIVISION
Coated Abrasives • Sharpening Stones
Pressure-Sensitive Tapes
District Offices
Worcester • Hartford • Cleveland • Chicago • Detroit
In Canada: J. H. Ryder Machinery Co., Ltd., Toronto 5

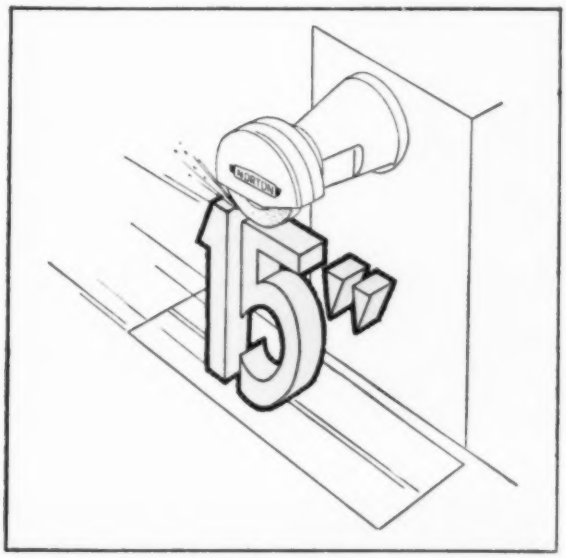
FASTER.... at lower cost

These and many other new features make this machine a "must" for your surface grinding jobs.

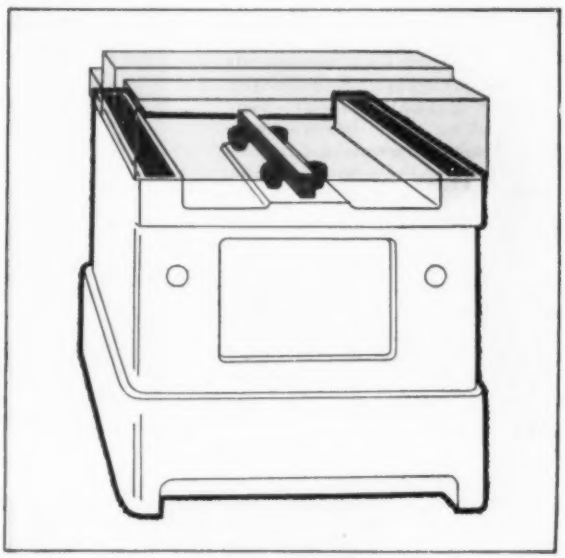


Finish flat faster, cut grinding time and increase production, with high table speed, 125 feet per minute.

Heat goes off in the chips, due to new, high table speed. This cooler grinding permits faster production on heat-sensitive metals.

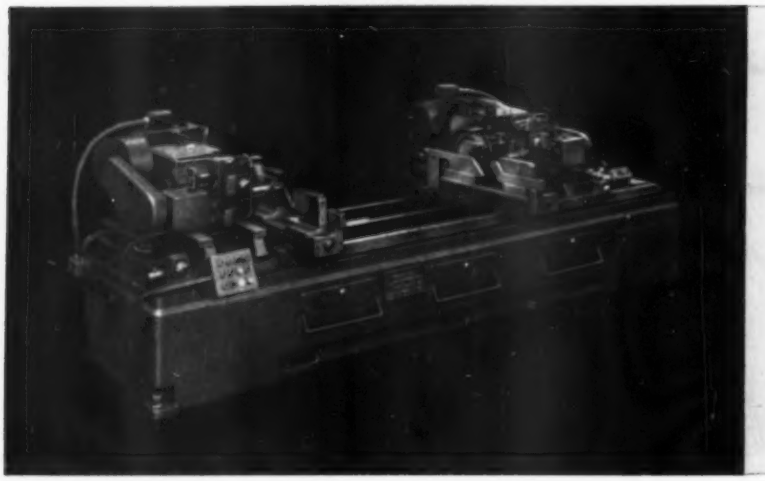


Handle taller work pieces with high-grind wheel head construction. The vertical capacity from the table top to the bottom of standard full size 8" diameter grinding wheel is 15"



Widely spaced, flat ways and guide-rail cross slide design maintain cross feed accuracy, providing lastingly accurate grinding of shoulders or parallel surfaces.

These MOTCH AND MERRYWEATHER precision



MILL & CENTER

Model MC 1648. Incorporates two standard milling heads and two standard drilling heads. Feed rates infinitely variable. Right hand unit is adjustable for varying part lengths. Fixtures are self-equalizing vises. Milling and drilling units, and clamping fixtures are hydraulically actuated and electrically controlled.

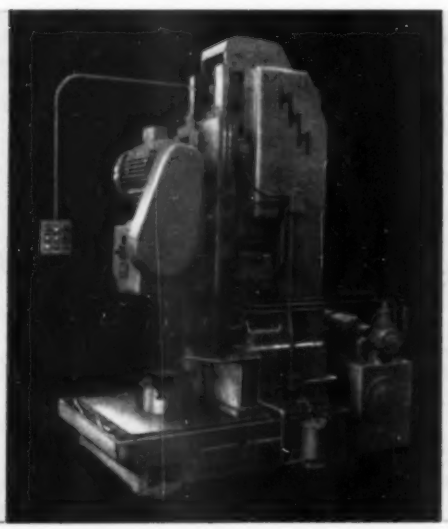
Available in two sizes: 1″ to 6″ diameter; 8″ to 48″ length, with 20 horsepower heads; and 1″ to 4″ diameter; 6″ to 24″ length, with 5 horsepower heads.

cut production costs...

UPRIGHT DRILLING & BORING MACHINE

Model VS 2615. Designed for heavy duty drilling and boring. This machine will accommodate many types of heads, making it adaptable to a wide variety of machining operations. Its standard automatic cycle consists of rapid traverse down, feed, and rapid return. Variations of this automatic cycle are available.

Available with speeds from 30 to 190 RPM, up to 40 horsepower, stroke of either 15″ or 30″, variable hydraulic feed, with maximum pressure of 20,000 pounds.



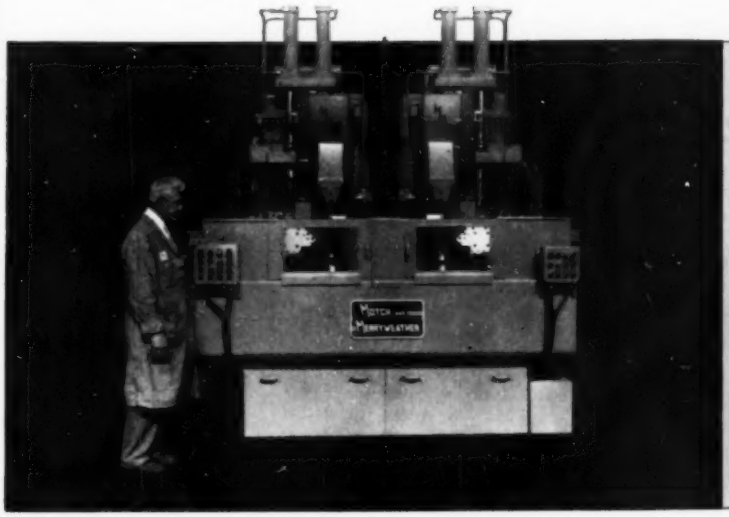
SINGLE END MILL & CENTER

Model SMC. Ideal for tool room or production work. Incorporates standard slide, milling and drilling head, adjustable stock support and stop assembly. Speed of milling and drilling head unit varied by changing easily accessible pulleys and belts. Performing both milling and drilling during one clamping, work is milled square to the center.

Available with diameter from ¾″ to 3½″, length from 4½″ to 48″, and 5 horsepower on the milling head.

speed up subsequent

performance machines...

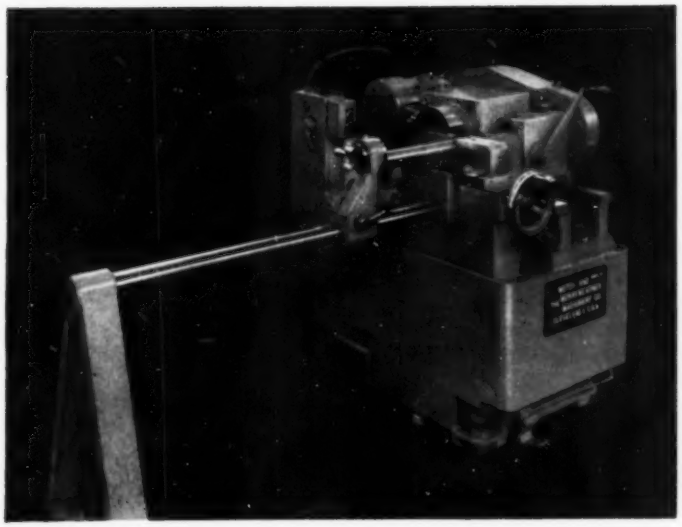


TWO-SPINDLE VERTICAL TURNER

Designed for precision, production-type turning, boring and facing. Two hydraulically-operated, automatically lubricated tool slides are mounted on hardened and ground steel ways with tapered gibs for accurate alignment. Spindle and slide units will operate independently, have separate controls.

Available with 20" swing; spindle speeds from 20 to 5000 RPM; stroke—horizontal 6", vertical 12"; and variable hydraulic feed.

Partial view of M&M's expanded Cleveland facilities. Why not visit us at your first opportunity?



operations

• Keeping pace with the increasing need for flexibility in standard metalworking machinery, M&M offers industry these four highly-flexible, readily-adaptable machine tools.

To learn how they can add flexibility—and dependability—to your machining operations call your Motch & Merryweather representative, or write directly to Motch & Merryweather Machinery Company, 1250 E. 222nd St., Cleveland 17, Ohio.

Machine Tool Manufacturing Division
Cutting Tool Manufacturing Division
CLEVELAND
Avey Division, Cincinnati

BUILDERS OF AUTOMATIC PRECISION CUT-OFF, MILLING, TURNING AND DRILLING MACHINERY

CIRCLE 187 READER SERVICE CARD

GUSTAV VON REIS, President
Detroit Broach & Machine Co.

a man who came to Fair Street

"We went to Fair Street to find out for ourselves if DeVlieg's fine reputation was backed up by facts"

"We were convinced. We purchased two JIGMILS and they have now been in operation for several years. These machines have all the fundamentals required to produce the highest degree of accuracy, and yet, are simple to operate. Besides this, and we feel most important of all, the JIGMIL has special features which largely eliminate our reliance on the human element to produce close tolerance work. JIGMILS enable us to produce our broaching machines and broaching tools to the very highest degree of accuracy, a matter of the utmost importance in our products."

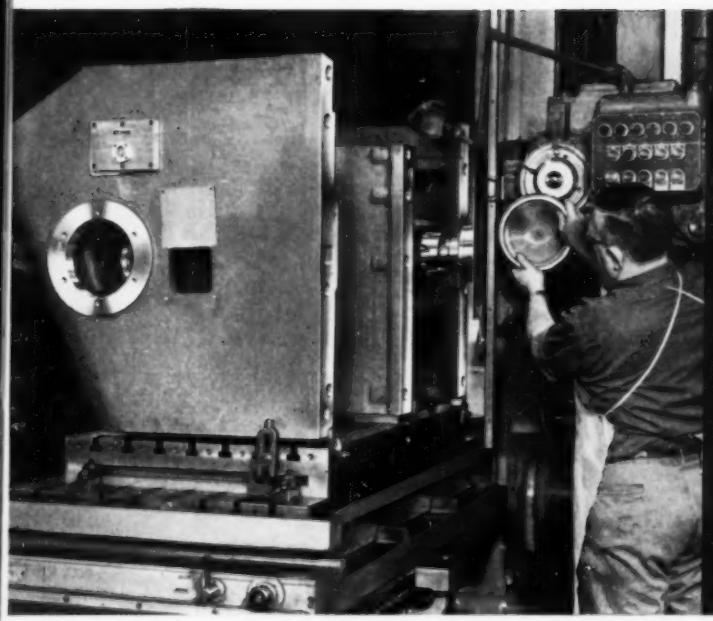
GUSTAV VON REIS

DE VLIEG MACHINE COMPANY, FAIR STREET • **ROYAL OAK, MICHIGAN**

CIRCLE 188 READER SERVICE CARD

SOME OF OUR JIGMIL USERS

Akramatic Engineering
American Mach. & Tool Co.
Apex Corp.
Barker Tool Die & Gauge Co.
Base Tool & Gage Co.
Bengal Boring Co.
Best Tool & Engineering Co.
B. H. Aircraft Co., Inc.
Black Rock Mfg. Co.
Bradley-Thompson Tool Co.
City Pattern Foundry & Mach. Co.
Compton Boring Co.
Crest Tool Industries, Inc.
Dearborn Tool & Die Co.
Detroit Gauge & Tool Co.
Detroit Jig Grinding Co.
Eglinton Carbide Products, Inc.
Ensign Tool & Gauge Inc.
Evans Tool & Die Co.
Fuller Tool Co.
Glendale Machine & Tool Co.
Hiser Jig Grinding Co.
Jameson Machine Co.
Jones Tool Products
Lamina Dies & Tools, Inc.
Langlois Tool & Die Corp.



A FEW PROVEN ADVANTAGES OF THE JIGMIL TECHNIQUE

- Eliminates cost of expensive jigs and production delays resulting from their manufacture.
- Simplifies tooling.
- Employs automatic functions to reduce factors of human error even in close tolerance work.
- Makes possible greater flexibility of product design.
- Improves end product by permitting interchangeable assembly of parts without hand fitting.
- Increases production and product accuracy.

ACCURACY IS AN ECONOMY!

JIGMIL—EXTREME ACCURACY ON LARGE, WEIGHTY PARTS FOR DETROIT BROACH

Broaching machine knee, 65" long, weight 5500 lbs., set-up on a 32" x 60" index table on a Model 4B-72 JIGMIL. The knee is rough and finish milled, bored, drilled and tapped from four sides in one set-up. Formerly machined on a conventional boring mill, the job took 120 hours. The JIGMIL now completes all machining operations in 50 hours with consistent accuracy and without special tooling. Furthermore, the accuracy achieved effects substantial reductions in assembly time and improves the quality of the end product.

Maks Machine Co.
Mark Twain Tool & Mfg. Co.
McDonnell Machine Products, Inc.
Modern Industrial Eng. Co.
Mohawk Metal Forming & Tool Corp.
Mt. Clemens Mfg. Co.
Olofsson Tool & Die Co.
A. E. Parker & Sons Co.
Precision Boring Co.
Product Engineering & Mfg. Corp.
Progressive Industries Co.
Schwartz Mach. Co.
Special Machine & Eng., Inc.
Tragge Boring Co., Inc.
Turner Bros., Inc.
Vulcan Eng. Co.
Westfield Tool & Eng. Co.

WILL YOU BE THE NEXT TO VISIT FAIR STREET

Our newest catalog will help you decide. May we send it?

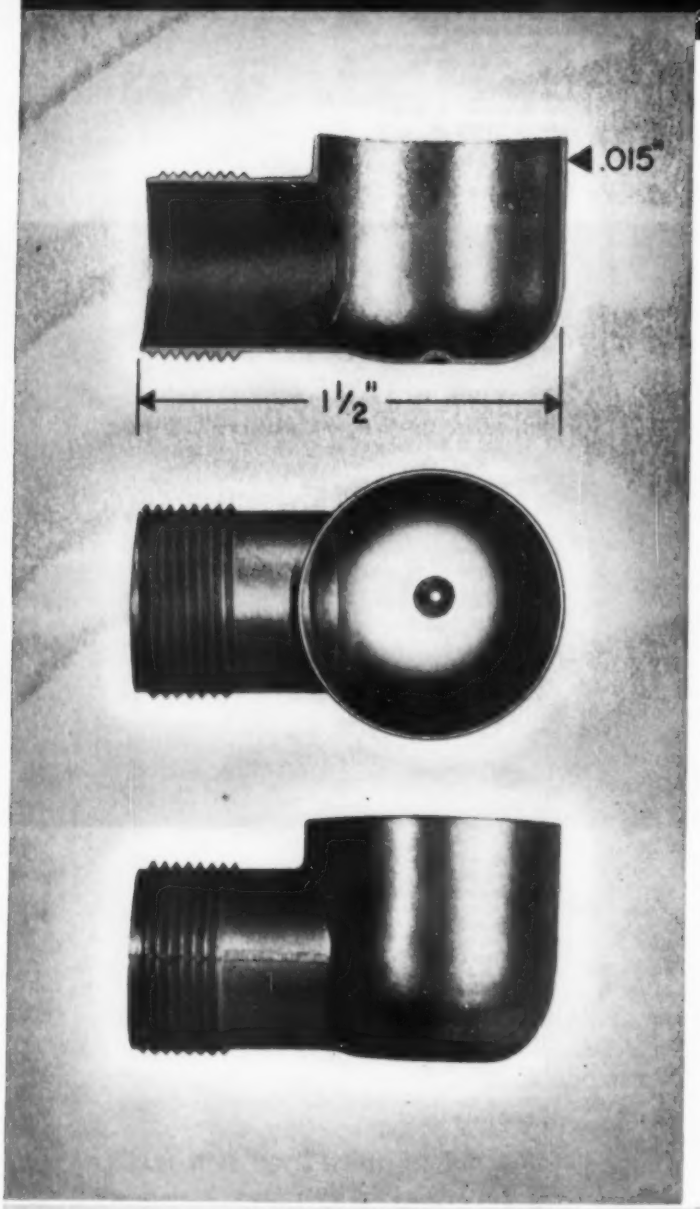
DeVlieg

SPIRAMATIC JIGMILS®

ACCURATE HOLES AND FLAT SURFACES IN PRECISE LOCATIONS

CIRCLE 189 READER SERVICE CARD

IT'S LIGHTER THAN YOU THINK!



AND STRONGER, TOO, WHEN DIE CAST with ZAMAK

This thin-wall spark plug shield is a zinc die casting with minimum wall thickness of only .015".

Many zinc die castings are as thin as stampings, yet can be produced in shapes that cannot be duplicated as one-piece stampings.

More and more, engineers are learning that they can design parts for ZAMAK alloy die casting that will compete with either steel stampings or castings of the lightweight metals—and at lower cost.

THE NEW EDITION OF "END USES OF ZINC DIE CASTINGS"

SEND FOR YOUR COPY TODAY

HORSE HEAD® SPECIAL ZINC AND HORSE HEAD ZAMAK ARE PRODUCED BY

THE NEW JERSEY ZINC COMPANY

DEVELOPERS OF THE ONLY STANDARD ZINC DIE CASTING ALLOYS IN USE TODAY

160 Front Street · New York 38, N. Y.

HORSE HEAD PRODUCTS®

versatility:

precision grind TWO parallel surfaces of widely varying parts in ONE operation

Gardner 2H30
precision double spindle grinder

Send prints of your parts for a Gardner proposal and request new general catalog.

GARDNER

precision disc grinders

BELOIT, WISCONSIN

How

RYKO

In just two years since introduction, **RYKON** Grease has stepped in to deliver lubrication in hundreds of applications where other greases have failed

The reason RYKON Grease can perform under conditions that cause other greases to fail is this: RYKON Grease has a unique non-soap, organic thickener. This thickener holds the oil between its fibers better than any other gelling agent. The thickener is able to withstand extremely high as well as low temperatures. It resists chemical action and remains stable under conditions of severe working and water washing. RYKON Grease has exceptional anti-rust properties.

RYKON Grease's unique properties make it truly multi-purpose. This leads to many worthwhile economies. With one grease to do possibly every grease lubrication job in a plant, there's no chance for application mistakes. Inventory and handling of many single-purpose greases is reduced or eliminated. Maintenance training and supervisory follow-up is greatly reduced.

More facts about RYKON Grease are yours for the asking. Call the lubrication specialist in your nearby Standard Oil office in any of the 15 Midwest and Rocky Mountain states. Or write **Standard Oil Company (Indiana), 910 S. Michigan Ave., Chicago 80, Illinois.**

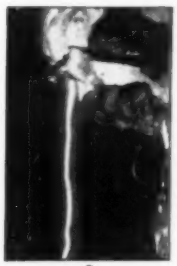
CIRCLE 192 READER SERVICE CARD

N GREASE

High temperature test for grease. Grease samples are spread on metal strips and placed in 350° F. oven for five days. Only RYKON Grease remained workable at end of test.

has performed in ten tough applications

1



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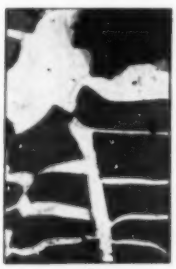


4

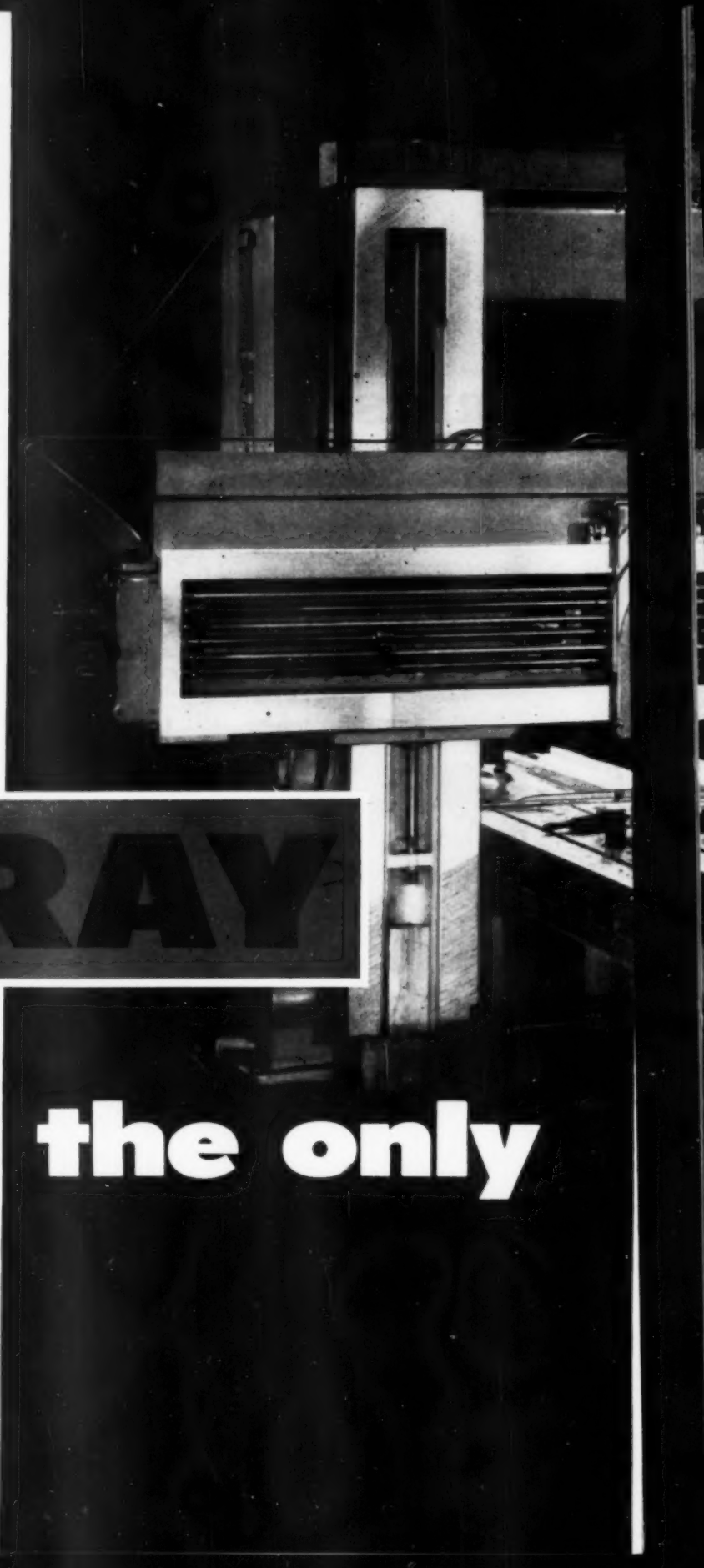
Oven test shows high temperature performance of RYKON Grease. 1. Metal panel coated with RYKON and placed in oven at 350° F. 2. Same panel after five days. RYKON is still soft and ready to lubricate. 3. Another high-melt grease ready for same test. 4. Same panel after oven test Grease has failed completely.

In the metalworking industry, where higher speeds, loads, temperatures and pressures are being put on bearings as a means of increasing productivity of equipment, a new type of grease has been needed. RYKON is that grease. Here are just 10 examples of how RYKON Grease has performed in tough spots:

Industry	Equipment	Type of Bearings	Conditions	Remarks
Steel Mill	various	plain and anti-friction	high temperature, heavy load, water, dirt	Outperforms all previously used greases. Less consumption, fewer bearing failures.
Steel Mill	tin line	plain and roller	high temperature, water	Hot caustic water caused other greases to run out and form deposits. RYKON lasts twice as long.
Metalworking	bearings over molten pot	—	high temperature	Temperature reaches 500° F. at times. RYKON stays in longer.
Steel Mill	pit crane, floor crane, charging car	plain and anti-friction	high temperature	Lasts twice as long as some other greases used.
Metalworking	drill head multi-spindle	anti-friction	heavy load	Other greases failed. Running cool on RYKON. No leakage.
Auto Manufacturer	switches on machine tools	—	wet	Good water protection and dielectric strength at a lower cost than previously
Die Caster	die cast machines	various	high temperature	Cut down wear considerably.
Bearing Manufacturer	high speed spindle bearings	anti-friction	high temperature, heavy load	Lasts twice as long as a high priced bearing grease. Does not darken or form varnish.
Steel Fabricator	core oven conveyer	pulley bearings	high temperature and dirt	Works where other greases ran out. RYKON best ever used.
Steel Fabricator	oven conveyer	ball	high temperature	All previous greases caused trolley bearings to stick. RYKON solved problem.

You expect more from **STANDARD** *and you get it!*

CIRCLE 193 READER SERVICE CARD



heavy-duty planing

The Gray Universal is the world's most powerful planer available for conventional planing. Its rigidity and speed are ideally suited for modern carbide cutting.

double-cutting

The flick of a lever, the touch of a button permits double-cutting. Elimination of the idle stroke insures the world's most efficient flat surface machining. Only simple carbide tools are required.

triple-cutting

Rough and rough-finish plane at the same time. Rough by double-cut planing and simultaneously rough-finish with a single point tool. Then finish plane without a tool change.

cross planing

Eliminates extra settings by cross planing the occasional keyways, chamfered corners, and other troublesome small cross surfaces that formerly added hours to your set-up time.

a GRAY

the only

This new 84" x 60" x 18' Gray Universal Planer shown in operation at the Koppers Co., cuts going - cuts coming, removes big chips at double rate. There is no idle return stroke to waste precious production hours. Instantaneous reversals with heavy duty double-cutting make this the first REAL new development in modern planers ...a *GRAY exclusive.*

Double tables further virtually eliminate the costly set-up time required by ordinary planers.

The multiple savings received by users of the new Gray Universal make it a wise investment.

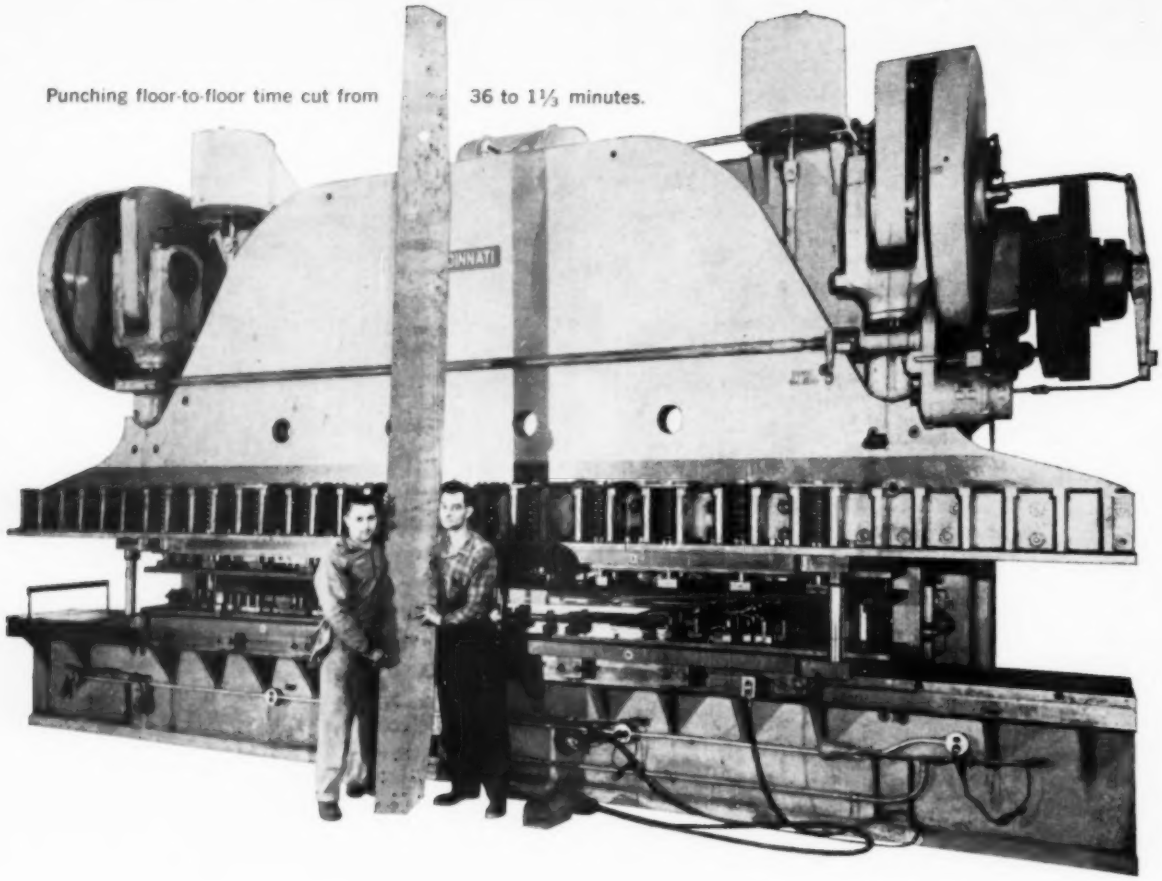
If it's new... it must be a GRAY.

The G. A. GRAY Co.,
Cincinnati, Ohio

CIRCLE 194 READER SERVICE CARD

GRAY Universal Planer shown in operation at the Baltimore plant of Koppers Company, Inc., Metal Products Division.

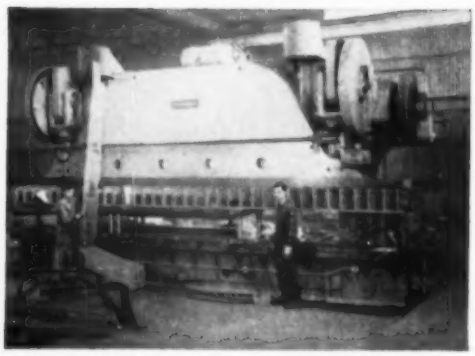
new planer



Punching floor-to-floor time cut from 36 to 1⅓ minutes.

Photos courtesy Fort Wayne Structural Steel Co., Inc.

70 minutes cut to 2.6 minutes



Blanking floor-to-floor time cut from 34 to 1¼ minutes.

Production time has been reduced 96.2% on these long truck side rail reinforcements, thanks to the versatility of this Cincinnati® All-Steel Press Brake.

Operating data, furnished by John L. Hayner, President of Fort Wayne Structural Steel Co., Inc., show how his company slashed production costs so substantially.

They decreased floor-to-floor time from 34 minutes to 1¼ minutes on blanking ¼" C1010 Steel with a 202" cutting edge. By punching 130 holes per stroke, they dropped floor-to-floor time from 36 minutes to 1⅓ minutes.

Talk with our Application Engineering department about applying a time-cutting Cincinnati Press Brake in your shop. It can be the most profitable decision you've made this year. Write Department A for Press Brake catalog.

Shapers / Shears / Press Brakes

THE CINCINNATI SHAPER CO.

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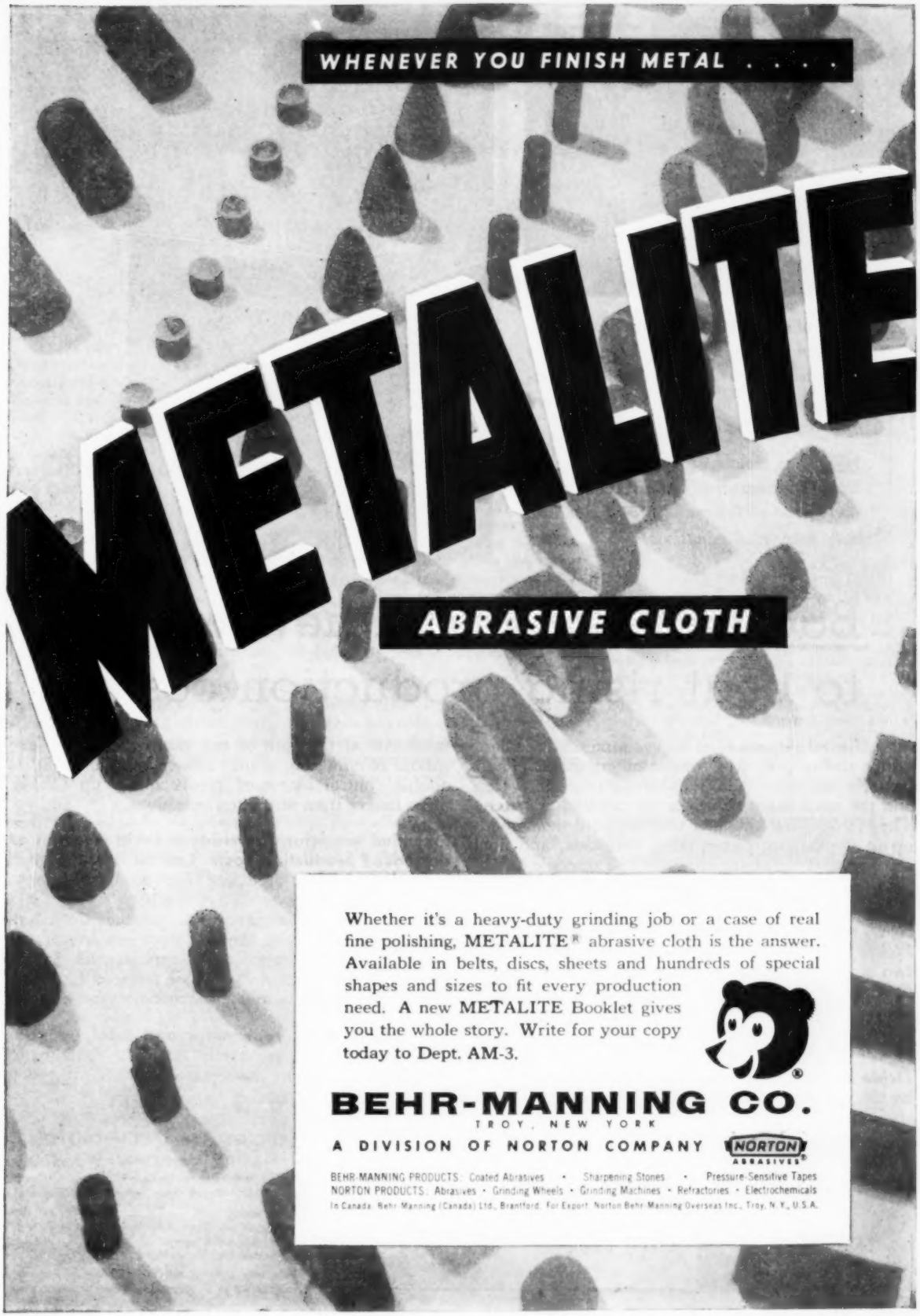
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Coolant sumps are breeding grounds for harmful bacteria. Laboratory analyses have found as many as 3 billion bacteria per ml. in emulsions that were only a few days old.

NOW, a simple, safe treatment with Elcide 75 keeps the bacteria count down and increases the useful life of standard duty soluble oil emulsions.

Bacteria Control: A new way to beat rising production costs

Many harmful types of bacteria contaminate coolant sumps and help destroy soluble oil emulsions. These bacteria first enter emulsions through the air, water, and the usual plant debris in the circulation system. They feed on the oil-water mixture until their build-up in the coolant causes odor, corrosion, and final separation of the emulsion. These microscopic organisms are costing the metalworking industry millions of dollars each year.

Now, this damage can be stopped with Elcide 75. Elcide 75 is a new bacterial inhibitor composed of two separate, but well-proven, anti-bacterial agents. One of these is related to a material that is popularly used in the exacting field of surgical practice. This powerful action controls a wider range of bacteria than the commonly used germicides now being marketed.

Elcide 75 has been carefully tested and evaluated by several large metalworking plants. Added to fresh emulsions at the rate of one ounce per each four gallons of emulsion, plant researchers found that its double control increased emulsion life up to 5½ times longer than untreated emulsions.

Extended emulsion life starts a chain reaction of decreased production costs. Less oil concentrate is needed to do the same job. The number of man-hours required for servicing machine sump tanks and disposing of waste oil is greatly reduced. Production increases because the machines run longer between emulsion changes. Additional benefits gained from the use of Elcide 75 include reduced corrosion of tools and products, and elimination of rancid odors.

Try Elcide 75 in your plant and total up your savings. You'll be pleasantly surprised to find out just how important bacteria control is to good plant management.

ELCIDE 75™

PATENT PENDING

KEEPS COOLANTS FRESH AS A DAISY!

ELCIDE 75: SPECIFICATIONS

(Lilly's brand of bacterial inhibitor for cutting fluids)

Active Ingredients—Sodium Ethylmercuri Thiosalicylate (Thimerosal) and Sodium *o*-phenylphenate

Package	Price per Gal.
1-gal. (4 per case), polyethylene	$8.50
5-gallon, polyethylene	$8.00
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PRODUCTION POINTERS from GISHOLT

More cost-cutting IDEAS– to help you

BODINE ELECTRIC CUTS TIME 65% WITH THIS SETUP

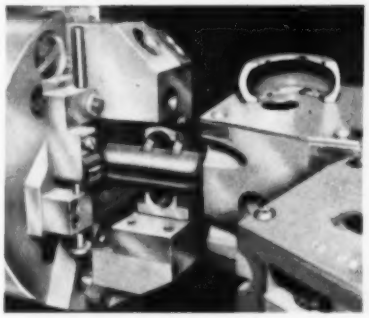
Automatic drive, smart tooling on No. 3 ram cut time and costs

Here are several production ideas you may find useful in your work. Bodine Electric, a well-known manufacturer of fractional h.p. motors in Chicago, Ill., has applied them on two Gisholt MASTERLINE No. 3 Ram Type Turret Lathes—cutting machining time an average of 50% on eight different parts. Gross production totals more than 80,000 units per year.

Replacing four obsolete turret lathes, both No. 3 rams are equipped with hydraulic drives that control all machine functions, including selection of speeds and feeds, reverse feed, stop and reverse of spindle, etc. The hydraulic drive actually converts the hand-operated turret lathes into AUTOMATIC CHUCKING TURRET LATHES, permitting one operator to handle both machines. Other plus factors include longer tool life and more uniform quality through use of correct speeds and feeds.

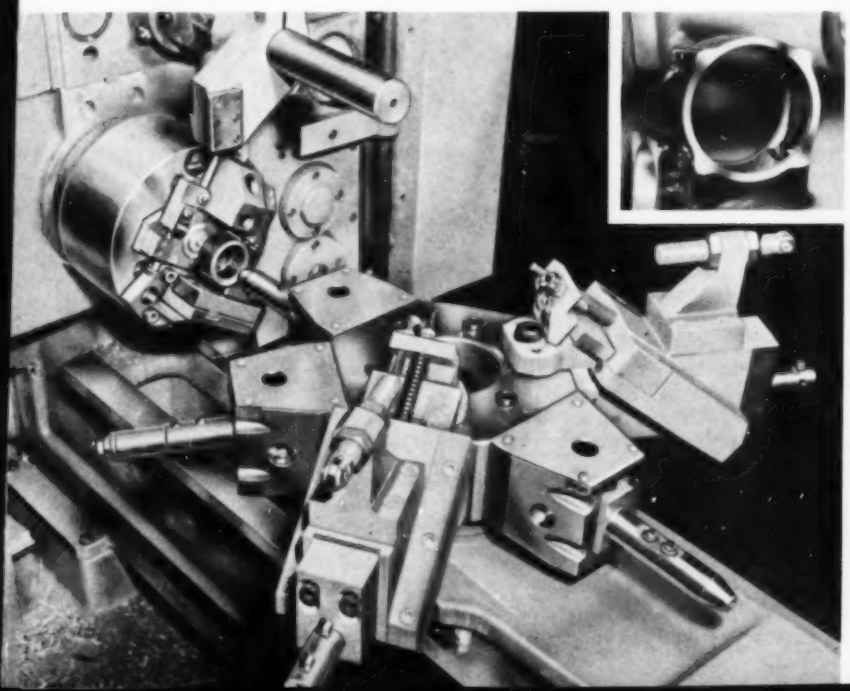
On the typical cast iron worm gear housing shown, time was cut 65% on the boring and facing operation alone. Parts are held in a 10", 2-jaw, air-operated fixture. A manually operated swinging stop mounted on the fixture face is used for length location and then moved out of the way after the part is chucked to provide clearance. The automatic cycle is started and the operator moves to the second machine while hex turret tools rough- and finish-bore, straddle-face and chamfer at the front and back, and bore a relief between the front and back bores. F.t.f. time, 2.5 minutes.

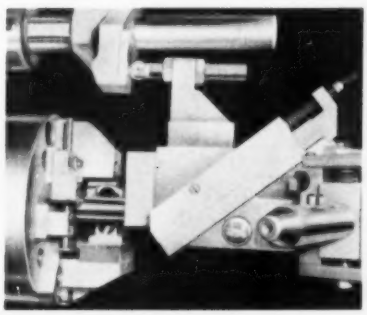
Automatic cycle controlled by hydraulic drive cuts time 65%, doubles operator productivity. Smart tooling eliminates "cutting air" and improves accuracy by machining front and back of work simultaneously.



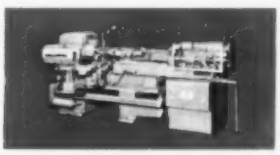
Special pivoting boring bars are used for rough- and finish-boring. As hex turret feeds forward, tapered end of boring bar enters straight bore of chuck pilot bushing. This raises pivoted bar aligning it with machine centerline and positions tools vertically to machine front and back bores simultaneously. Runout between 2¾" diameter front and back bores is held within .0015" with this method. Relief between front and back bores and front chamfer is also handled in this manner on another turret station.

Hydraulic drive and special hex turret tooling simplify and speed machining, assure greater accuracy, concentricity and parallelism between front and back faces. (Inset) Close-up of worm gear housing showing surfaces machined in 2.5 minutes f.t.f.





Automatic slide tools used for rough and finish-straddle-facing front and back, and chamfering back I.D. On forward feed of hex turret, a roller on movable slide contacts a dead stop bracket on overhead pilot bar. Slide is forced up incline on continued forward feed of hex turret, engaging tools that straddle-face front and back simultaneously. Reverse feed on finish cut provides required smooth surface finish.



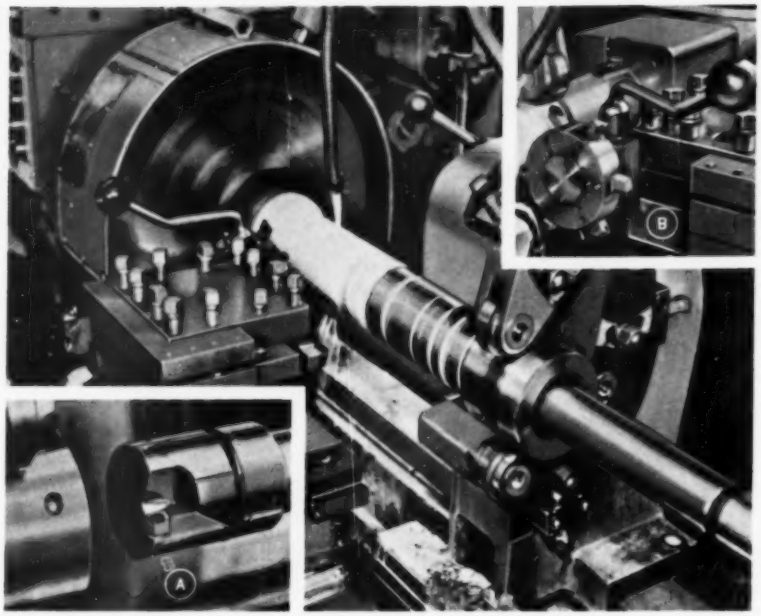
SETUP SAVES BAKER OIL TOOLS $30,000 PER YEAR

Smart tooling on MASTERLINE 3L Saddle Type Turret Lathe cuts time 25%

You will want to study this setup used by Baker Oil Tools, Inc., Los Angeles, Calif. It saves over $30,000 per year in the machining of centrifugally cast, iron retainer production packer bodies.

Several "extras" contribute to the dramatic saving: an indexing tool holder on the square turret, with six preset tools; special gun drilling and burnishing tools on the hex turret; a full-length lead screw for threading from either turret; an open-side steadyrest support for maximum accuracy in the long bore.

Here's how these "extras" are used on the small, 3½" O.D. end of the 31"-long body, shown. Held on the large-diameter end, the small bore is chamfered, then live center supported from the hex turret while the O.D. is turned from the square turret for steadyrest support. Other square turret tools, including those on the indexing holder, finish-machine the outside diameters, face the end and, using the lead screw threading attachment, cut an 8-pitch V-thread near the small end and an 8"-long, .015"-deep, 16-pitch buttress thread near the large end. During finish-threading, the gun drill removes ¼" stock per side, taking the rough cast hole to within .001" of finished size in one pass. The roller burnishing tool sizes and finishes the bore to a 32 micro-inch RMS finish or better. Time f.t.f., 41 minutes.



Preset tools on indexing holder complete O.D. turning while gun drill works in bore. (Inset A) Gun drilling head. Cutter life is 200 pieces per grind. (Inset B) Each preset tool on indexing tool holder has cutting life of 400 pieces.

Completely machined retainer production packer body. Used in oil and gas wells at depths to three miles or more, with pressures up to 10,000 p.s.i. and temperatures over 300 degrees.

Setup saves over $30,000 per year. Simultaneous use of hex and square turret tools, plus indexing tool holder, cuts time 25%. Gun drilling and burnishing tools eliminate boring, reaming, and subcontracted honing.

DoALL SUPERFINISHES TO IMPROVE PRODUCT QUALITY

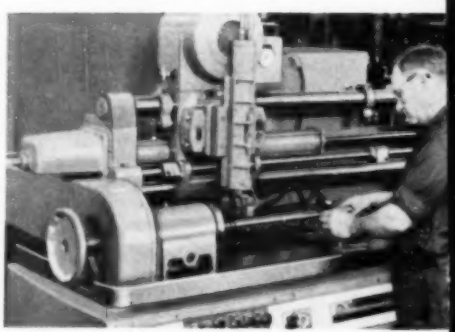
General-purpose 52A Superfinisher handles wide range of parts

How to improve product quality and still hold costs down is a major problem. Superfinishing is one of the answers. It is now part of a continuous product improvement program at The DoALL Company, Savage, Minn. Many components used in DoALL's line of machine tools, including band machines, surface grinders and others, are now being Superfinished.

Here's how the seal surfaces on piston rods used in hydraulic cylinders are improved by Superfinishing. Formerly the piston rods were ground to a 16 RMS surface finish, polished and chrome-plated. Still, some leakage took place past the rod seals.

Partial Superfinishing revealed grinding defects such as lobes and chatter. Now these defects are eliminated by grinding to a 30-50 RMS finish and then Superfinishing to a "controlled" 7-8 micro-inch RMS finish. All of the piston rods are now Superfinished, although in some cases it is restricted to the rod-seal area.

Superfinishing eliminates polishing prior to chrome-plating. Savings balance cost of Superfinishing operation. Improved rod surface gives longer seal life, eliminates field reports of leakage at seal.



Superfinishing improves product quality, provides better performance and reduces maintenance costs. Here the operator checks the final O.D. dimension on finished part.

ASK YOUR GISHOLT REPRESENTATIVE ABOUT FACTORY-REBUILT

GREENLEE BALANCES FOR MAXIMUM QUALITY WORK

MASTERLINE GISHOLT SINCE 1887

31S Balancer measures and locates unbalance on wide variety of high-speed parts

Looking for a quick, accurate way to get vibration-free performance from high-speed rotating parts or assemblies? Check this setup used by Greenlee Bros. Company, Rockford, Ill.

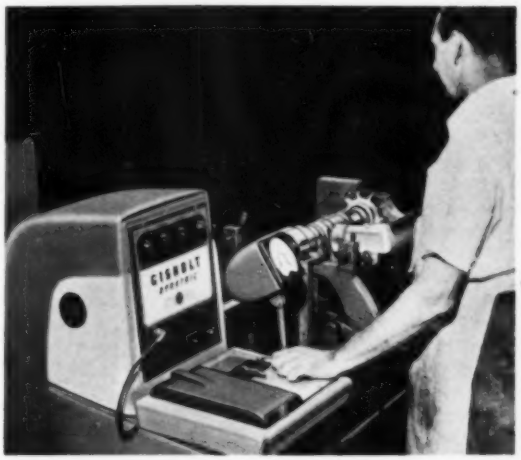
The 31S handles a variety of high-speed spindles, boring units, cutter head rotors, etc., used on Greenlee's well-known line of woodworking equipment and machine tools. Job-lots range from one to 15 pieces, weights up to 300 pounds.

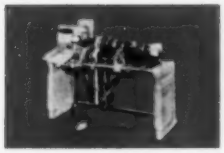
A special cradle fixture is used with bushing inserts to handle variations in length and diameter.

A cope unit arbor for the Greenlee No. 545 Double End Tenoner Woodworking Machine is a typical part. It operates at sustained speeds of 3600 to 7200 r.p.m., and performs such delicate operations as shaping panels and coping. Balancing eliminates vibrations that cause imperfections on the finished wood surfaces.

The arbor is placed in the cradle and is belt-driven. The strobe lamp and amount meter show the exact angle and amount of unbalance in each correction plane—indicating exact drill depth required for correction. F.t.f. time, just four minutes.

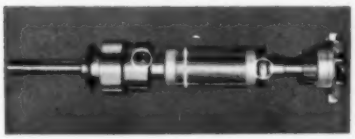
Unbalance in each correction plane is corrected within the specified tolerance on a drill press. Only minimum spot-checking is needed to inspect for balance since the 31S has proved consistently that correction can be made within the specified tolerance on the first try.





31S Balancer with extra-length bed and cradle fixture handles short or long parts on job-lot basis. Note strobe lamp and direct reading amount meter, in same visual plane, permitting operator to observe angle and amount of unbalance simultaneously.

The 31S is ideal for fast, accurate job-lot or production balancing. Features quick setup, ample capacity and ease of calibration, permitting unbalance measurement in terms of correction methods used.



Cope unit arbor for Greenlee No. 545 Double End Tenoner Woodworking Machine. Note correction for unbalance made by drilling at observed angle to indicate depth in bushings (encircled) to left and right of armature body.

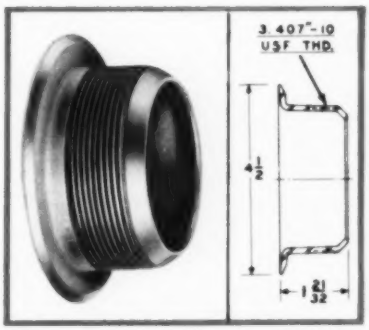
HOW CRI-DAN SOLVES A TOUGH THREADING PROBLEM

Single-point threading saves time, cuts tool and material costs

Want to turn your costly, troublesome threading jobs into money-saving operations? Then study the time-saving advantages of this setup on a CRI-DAN Model "B" Semi-Automatic, Single-Point Threading Machine.

The job: cutting a 3.407"-diameter, 10 TPI thread on a 303 stainless steel sink mounting flange used in home garbage disposal units. Work is held in the I.D. by a 3-jaw, 6" air chuck. Full-contour type chuck jaws, taper-turned to conform to the draft angle of the stamping, minimize possible distortion. No coolant is required as a single-point carbide threading tool, held in a heavy-duty tool block, makes 18 fast, automatic passes, completing the job in just 42 seconds.

The job was formerly handled on a thread milling machine but heavy cutting pressure required the use of heavy gage steel to prevent flexing.



The CRI-DAN single-point tool threading method reduces cutting pressure, so lighter gage stock is suitable—cutting material cost. Tooling costs are cut because a single-point carbide tool replaces a thread milling cutter. Maintenance cost is also low as the single-point tool produces more than 95 pieces between grinds.

Workpiece and drawing showing threading performed in 42 seconds. Savings in time and tooling costs alone are more than enough to justify the purchase of the CRI-DAN "B" machine.

CRI-DAN features inexpensive, single-point carbide tooling, semi-automatic operation for low-cost, high-production threading; provides more accurate lead and thread form on all types of internal or external threading operations.

MASTERLINE GISHOLT SINCE 1887

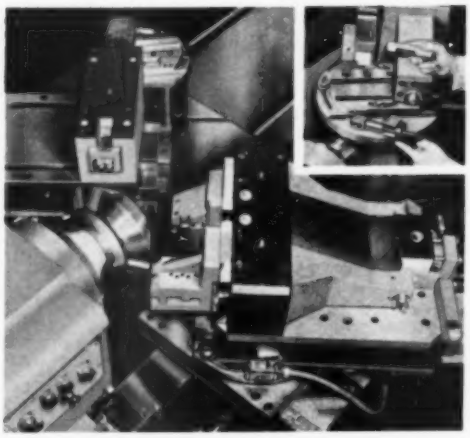
HARNISCHFEGER CUTS TIME 30% ON 27 BEVEL GEAR SIZES

Swivel base slides, gage bushings speed setups on No. 24

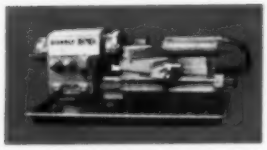
Interested in cutting angular machining costs where stock removal is heavy and tolerances are held to "minutes"? This setup, used by Harnischfeger Corporation, Milwaukee, Wis., will show you how.

Here one basic setup on a Gisholt MASTERLINE No. 24 Automatic Chucking Lathe handles 27 sizes of steel bevel gear blanks. Machining time is cut an average of 30%. Back angles, front counterbores and faces are machined, and sharp O.D. corners are broken, by straddle tools in two special blocks on the front independent slide. The blocks swing open for tool relief. At the same time, the face cone angles are generated by a cam-controlled tool in a sliding holder on the rear independent slide. F.t.f. time on the typical 12¼"-diameter, 5½"-wide part shown is only 7½ minutes.

Special tooling reduces setup time. ***Expanding mandrel*** **holds work in bore, drives with key or against back lug. Eight mandrels handle all parts; bushings compensate for diameter changes.** ***Front carriage top*** **adjusts for fast transverse settings.** ***Independent slide*** with swivel base mounts on carriage top and supports straddle tool blocks. *Independent slide* on rear carriage has swivel base. It supports special tool block with sliding tool holder, which is controlled by cam plate on angularly adjustable pedestal mounted on rear carriage top. *Gage bushings*, clamped between positive stops and swivel bases on independent slides, assure quick, accurate angular settings.



Completed part on mandrel, straddle tools on front independent slide, and face cone angle generating tools on sliding tool holder in block on rear independent slide. (Inset) Operator holds gage bushing, indicates how it slips on threaded shaft attached to swivel base. Shaft swings between swivel base and positive stop. Nut is tightened from opposite side to complete angle setting.



Master gage bushings, swivel bases on independent slides and pedestal-mounted cam plate plus adjustable front carriage top cut change-over time 15%. Fast, automatic cycle provides maximum stock removal, highest efficiency.

HOW YOU CAN SAVE TIME AND CUT COSTS ON FIXTURE WORK

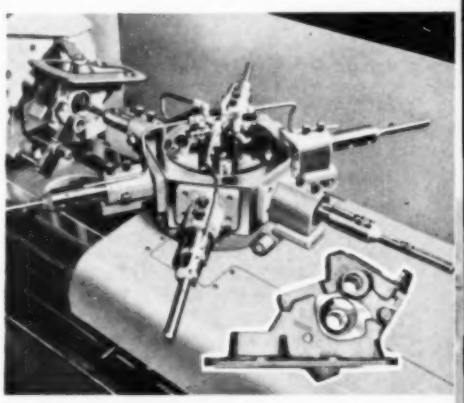
Fixture on double-tooled automatic turret lathe speeds and simplifies job

How much could you save on your odd-shaped parts requiring special holding fixtures if you used automatic cycle machining?

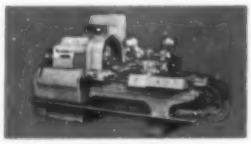
This setup on a Gisholt 2F Fastermatic Automatic Chucking Turret Lathe which is cutting time 25% on a tough boring operation may give you some ideas. It is used by a large automotive parts manufacturer to machine cast iron tractor steering gear housings. Work quality and tool life have been improved and automatic cycle permits the operator to handle a second Fastermatic.

A counterbalanced fixture is used, with a special arbor for center location in two bores, and a dead stop for length location against a milled face. Manually operated clamps hold the work. Piloted boring bars on hex turret stations 1, 2 and 3 rough, semi-finish, finish-bore and chamfer a 2¾"-diameter bore at the front and a 1¼"-diameter bore at the back. The back bore is also shave-faced. Micro-bore tools, used on hex 3, are so arranged that the front bore is completed just as the lead tool begins to finish the back bore. Rigid piloted tooling, plus separate finishing cuts, minimizes deflection and permits holding a .0005" tolerance in the back bore. Time f.t.f., only 3.5 minutes.

A duplicate set of tools on hex turret stations 4, 5 and 6 permits finishing two parts with each complete index of the hex turret. No time is lost indexing past idle stations and twice the usual number of parts is finished between tool changes.



Special fixture speeds handling of odd-shaped cast iron tractor steering gear housing shown. Piloted finish-boring tools machine front and back bores separately to hold .0005" tolerance in back bore.



Special fixture speeds work-handling. Double-tooled hex turret minimizes non-productive time. Automatic cycle permits operator to handle second Fastermatic.

No. 3-459
730

The Gisholt Round Table represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

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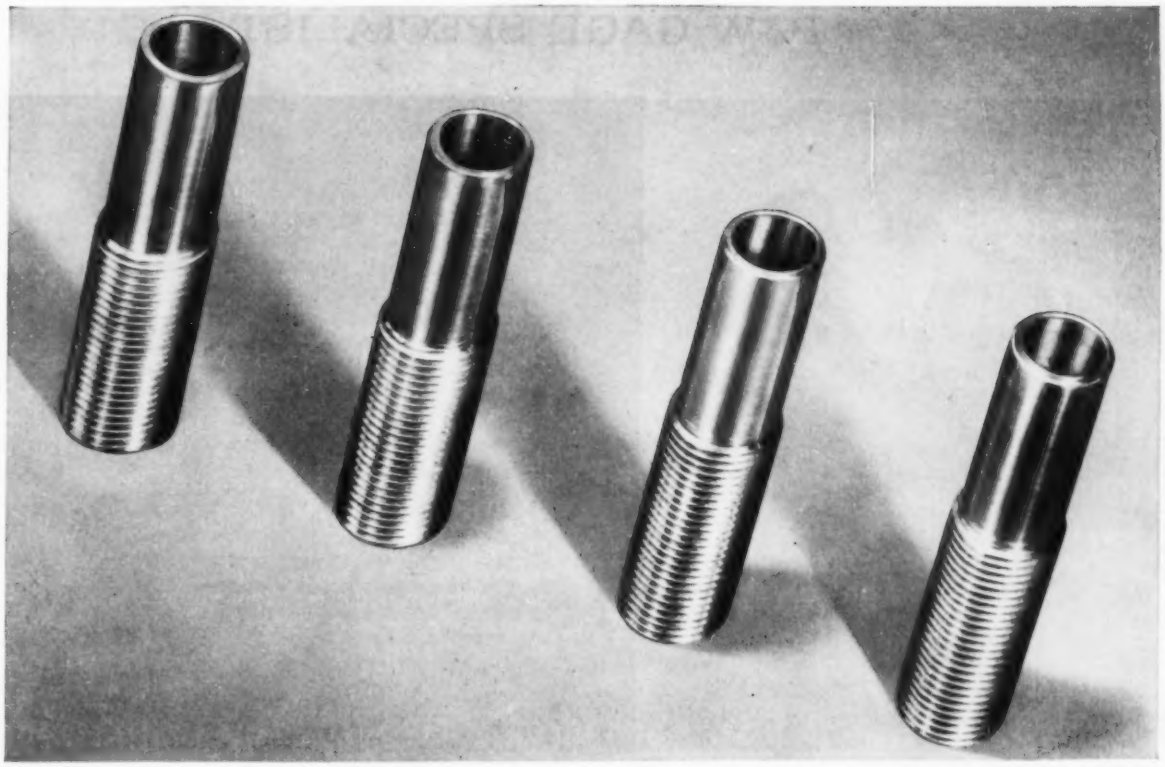
USS Free-Machining Leaded Steel
Bessemer or Open Hearth



Notice the fine finish and the clean, smooth threads on these parts made from USS Free-Machining Leaded Steel.

USS Free-Machining Leaded Steel is not only fast-machining and easy on the tools, but it produces an exceptionally fine finish. The established high quality of USS Free-Machining Steel plus a lead addition assures a superior free-machining steel.

Now United States Steel is making this superior Free-Machining Leaded Steel available to you in either Bessemer or Open Hearth Steel enabling you to utilize that steel which best suits your special end use.

If you are now using Free-Machining Steel and are looking for a superior product, we urge you to try USS Free-Machining Leaded Steel, either Bessemer or Open Hearth. They will do the job better—when fine finish and fast production are your problems.

You can get USS Free-Machining Steel in all the usual sizes or rounds, squares, hexagons and flats. Write United States Steel Corporation, 525 William Penn Place, Pittsburgh 30, Pennsylvania. *USS is a registered trademark*

United States Steel Corporation — Pittsburgh
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MASTERLINE GISHOLT SINCE 1887

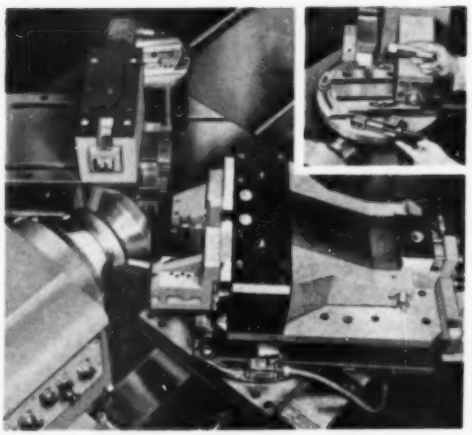
HARNISCHFEGER CUTS TIME 30% ON 27 BEVEL GEAR SIZES

Swivel base slides, gage bushings speed setups on No. 24

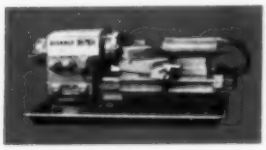
Interested in cutting angular machining costs where stock removal is heavy and tolerances are held to "minutes"? This setup, used by Harnischfeger Corporation, Milwaukee, Wis., will show you how.

Here one basic setup on a Gisholt MASTERLINE No. 24 Automatic Chucking Lathe handles 27 sizes of steel bevel gear blanks. Machining time is cut an average of 30%. Back angles, front counterbores and faces are machined, and sharp O.D. corners are broken, by straddle tools in two special blocks on the front independent slide. The blocks swing open for tool relief. At the same time, the face cone angles are generated by a cam-controlled tool in a sliding holder on the rear independent slide. F.t.f. time on the typical 12¾"-diameter, 5½"-wide part shown is only 7½ minutes.

Special tooling reduces setup time. ***Expanding mandrel*** **holds work in bore, drives with key or against back lug. Eight mandrels handle all parts; bushings compensate for diameter changes.** ***Front carriage top*** **adjusts for fast transverse settings.** ***Independent slide*** with swivel base mounts on carriage top and supports straddle tool blocks. *Independent slide* on rear carriage has swivel base. It supports special tool block with sliding tool holder, which is controlled by cam plate on angularly adjustable pedestal mounted on rear carriage top. *Gage bushings*, clamped between positive stops and swivel bases on independent slides, assure quick, accurate angular settings.



Completed part on mandrel, straddle tools on front independent slide, and face cone angle generating tools on sliding tool holder in block on rear independent slide. (Inset) Operator holds gage bushing, indicates how it slips on threaded shaft attached to swivel base. Shaft swings between swivel base and positive stop. Nut is tightened from opposite side to complete angle setting.



Master gage bushings, swivel bases on independent slides and pedestal-mounted cam plate plus adjustable front carriage top cut change-over time 15%. Fast, automatic cycle provides maximum stock removal, highest efficiency.

HOW YOU CAN SAVE TIME AND CUT COSTS ON FIXTURE WORK

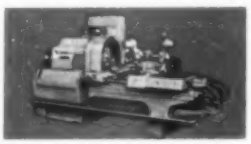
Fixture on double-tooled automatic turret lathe speeds and simplifies job

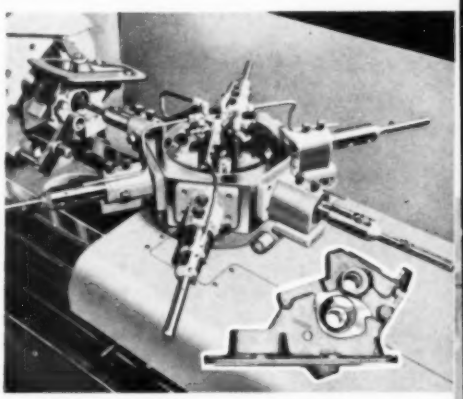
How much could you save on your odd-shaped parts requiring special holding fixtures if you used automatic cycle machining?

This setup on a Gisholt 2F Fastermatic Automatic Chucking Turret Lathe which is cutting time 25% on a tough boring operation may give you some ideas. It is used by a large automotive parts manufacturer to machine cast iron tractor steering gear housings. Work quality and tool life have been improved and automatic cycle permits the operator to handle a second Fastermatic.

A counterbalanced fixture is used, with a special arbor for center location in two bores, and a dead stop for length location against a milled face. Manually operated clamps hold the work. Piloted boring bars on hex turret stations 1, 2 and 3 rough, semi-finish, finish-bore and chamfer a 2¾"-diameter bore at the front and a 1¼"-diameter bore at the back. The back bore is also shave-faced. Micro-bore tools, used on hex 3, are so arranged that the front bore is completed just as the lead tool begins to finish the back bore. Rigid piloted tooling, plus separate finishing cuts, minimizes deflection and permits holding a .0005" tolerance in the back bore. Time f.t.f., only 3.5 minutes.

A duplicate set of tools on hex turret stations 4, 5 and 6 permits finishing two parts with each complete index of the hex turret. No time is lost indexing past idle stations and twice the usual number of parts is finished between tool changes.





Special fixture speeds handling of odd-shaped cast iron tractor steering gear housing shown. Piloted finish-boring tools machine front and back bores separately to hold .0005" tolerance in back bore.

Special fixture speeds work-handling. Double-tooled hex turret minimizes non-productive time. Automatic cycle permits operator to handle second Fastermatic.

No. 3-459
730

The Gisholt Round Table represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.

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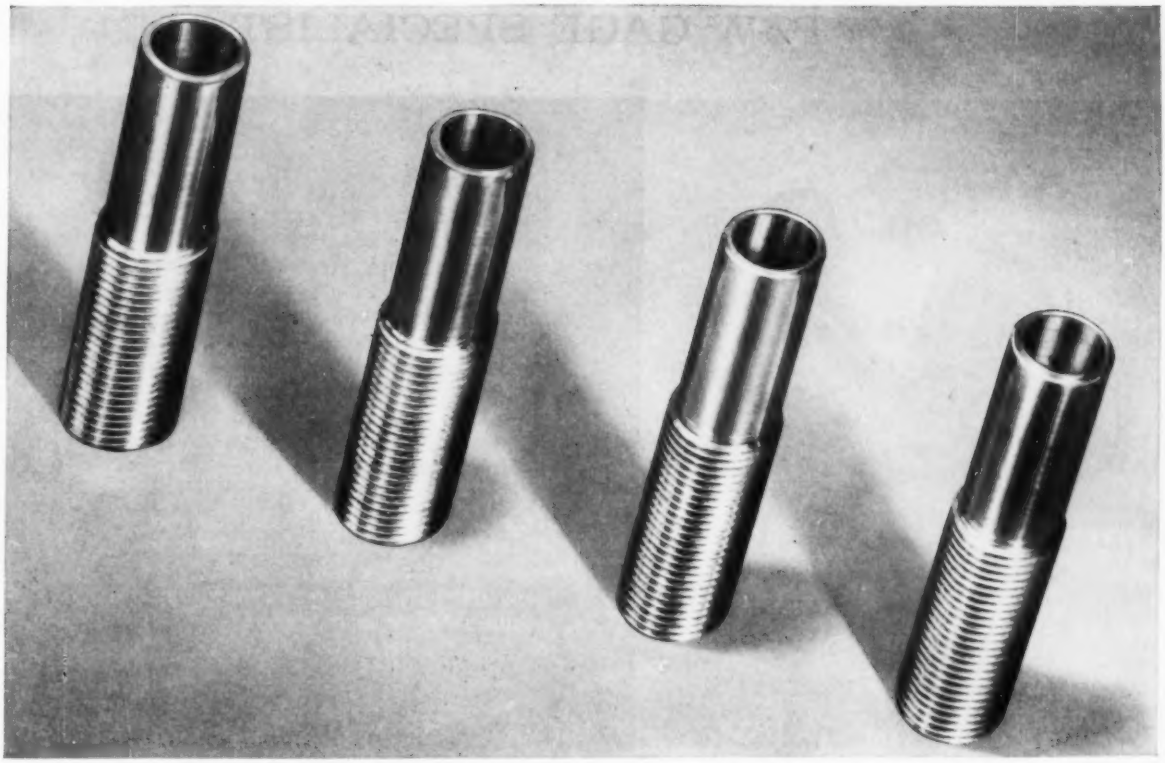
USS Free-Machining Leaded Steel
Bessemer or Open Hearth



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ACCURACY

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Pratt & Whitney HOKE® and USA Gage Blocks are accurate to millionths for size, flatness and parallelism. They *stay accurate longer*, because P&W gives extra care and attention to every detail of manufacture that can contribute to higher quality and better wear resistance. Remember, wherever precision measurement is concerned, the finest always costs less in the long run . . . so make your choice P&W and be *sure* of the finest!

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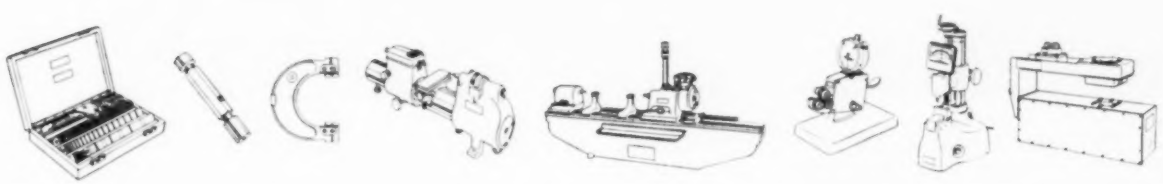

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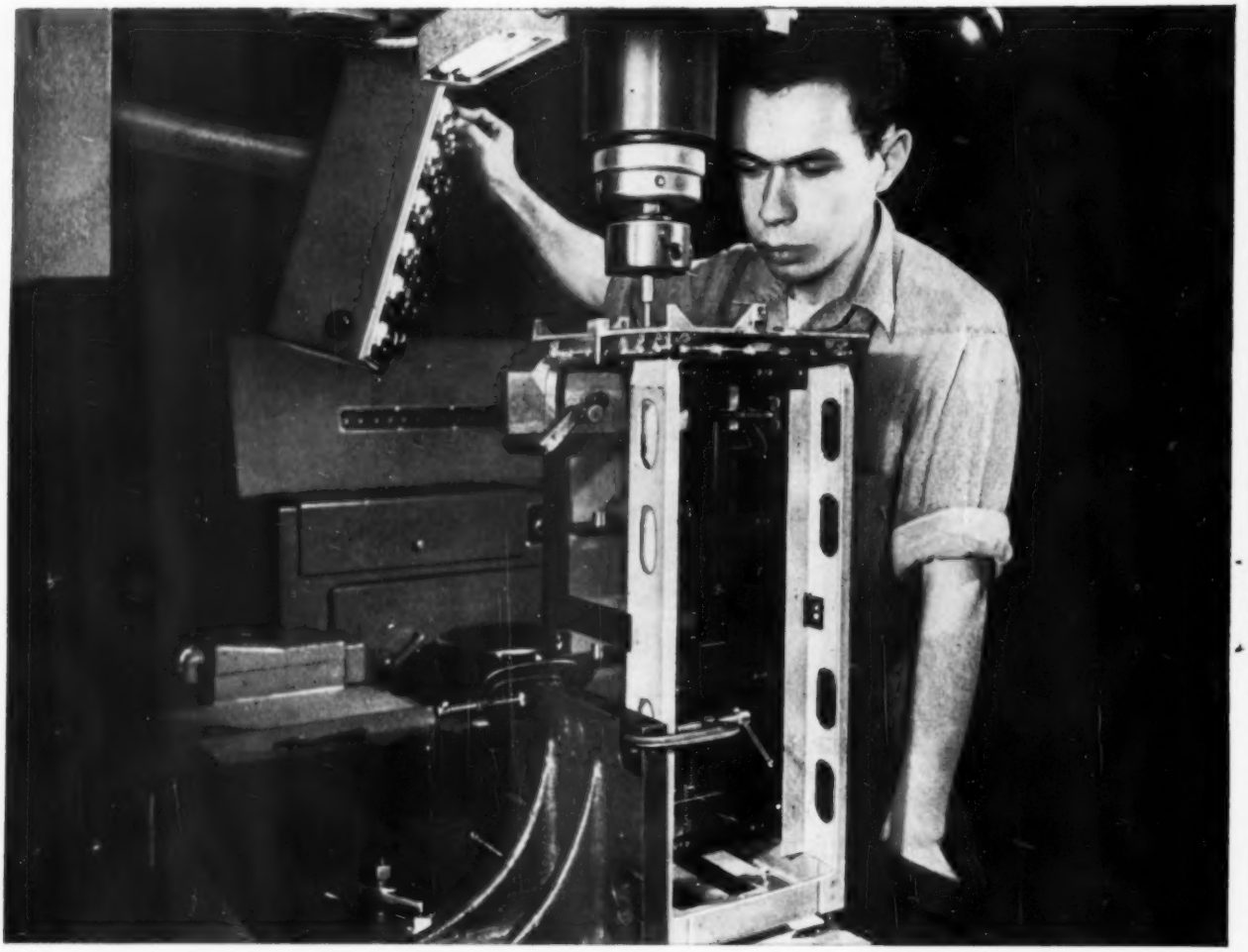

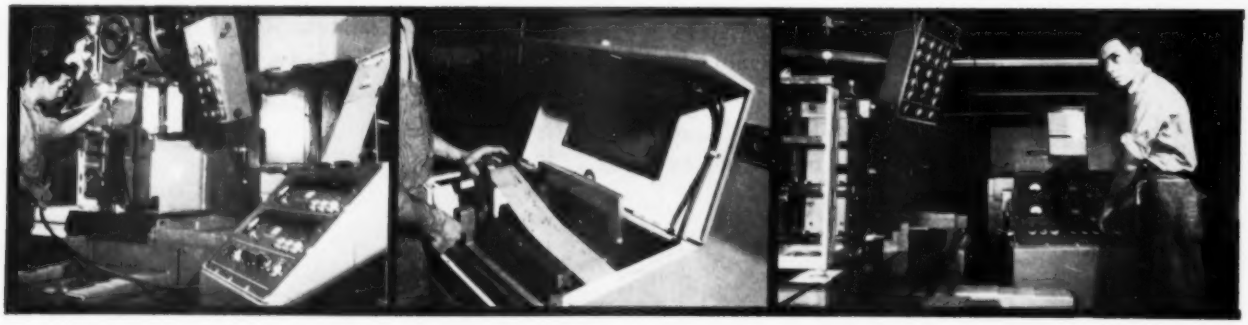

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A specialist in ultra-precision machining, the Liverpool Machine Tool Company Inc., of Brooklyn, N.Y., employs about 50 people and handles subcontract work for many nationally known manufacturers. All work must be held to extremely close tolerances. To give its customers "something better and faster," Liverpool purchased a Pratt & Whitney Jig Borer with Numerical Control a year ago, "... a huge investment for a plant of our size." The company now reports that most jobs on the P&W Numerically Controlled Jig Borer are done in *half the time* that would be required under manual operation. Production costs have dropped correspondingly, and lower rates for precision work have resulted in many new customers and much profitable new business.

The greatly increased machine utilization made possible by P&W Numerical Control assures that the machine is kept busy at all times; operation is so easy and economical that it can be used efficiently for a very wide range of jobs ... including much work previously handled on drill presses and many small parts once made largely by hand. Since increased business has meant more money for everyone, employees throughout the Liverpool plant are enthusiastic about Numerical Control.

In the past, small and medium sized plants have believed that Numerical Control was too expensive to permit investment. However, Liverpool's experience proves conclusively that no plant of *any* size can afford to overlook the business- and profit-building power of Numerical Control. It will pay *you* to find out the facts, so write today for Circular No. 609. Pratt & Whitney Company, Inc., 11 Charter Oak Blvd., West Hartford, Conn.

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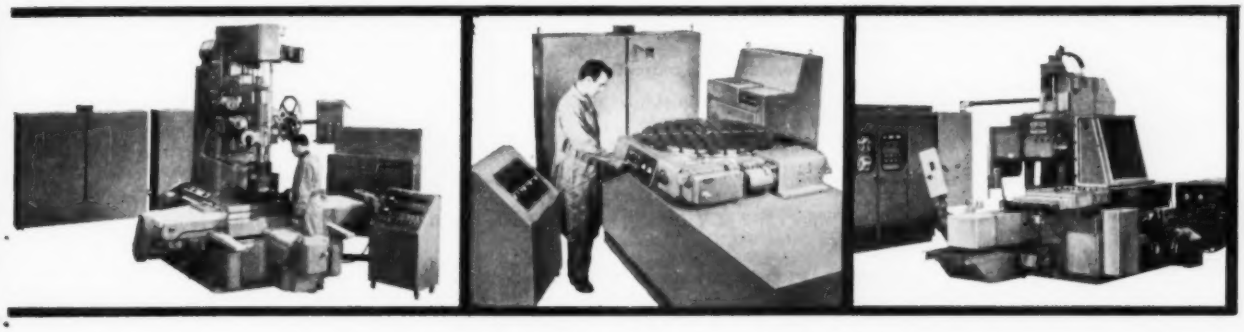

AUTOMATICALLY POSITIONING WORK ACCURATE TO .0001" ... the P&W Numerically Controlled Jig Borer combines toolroom precision with production-line speed, economy.

SETTINGS ACCURATE TO 5 SECONDS OF ARC ... are made automatically by the P&W Rotary Table with Numerical Control. Speeds work, eliminates human errors.

PROFILE MILLING ENTIRELY UNDER TAPE CONTROL ... the numerically controlled P&W Numeric-Keller produces irregular shapes without the need for any template or model.

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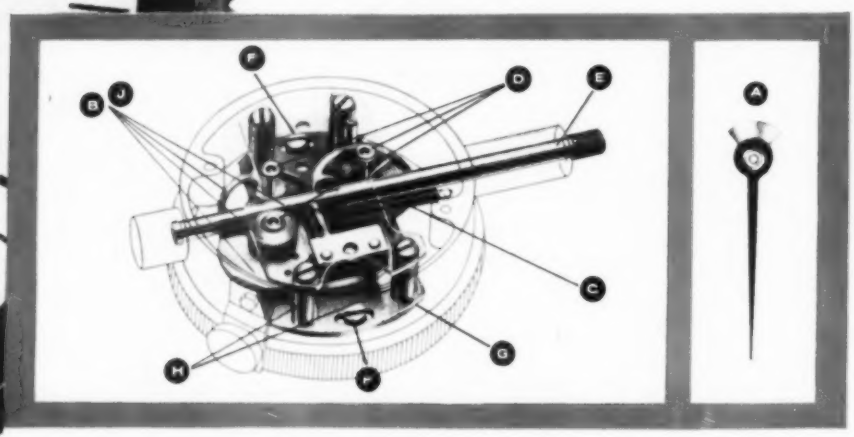

A **Functionally designed Indicating Hand** balanced for low inertia, provides greater sensitivity and better repeat accuracy. Hand has highest strength-to-mass ratio to preserve position and shape under heavy gaging action.

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J **Tough-Hardened Gears** available optionally on most models for greatly increased life, reduced friction and improved sensitivity.

Ask for your copy of Catalog 58. It describes the full line of Federal Dial Indicators — the world's most extensive line.

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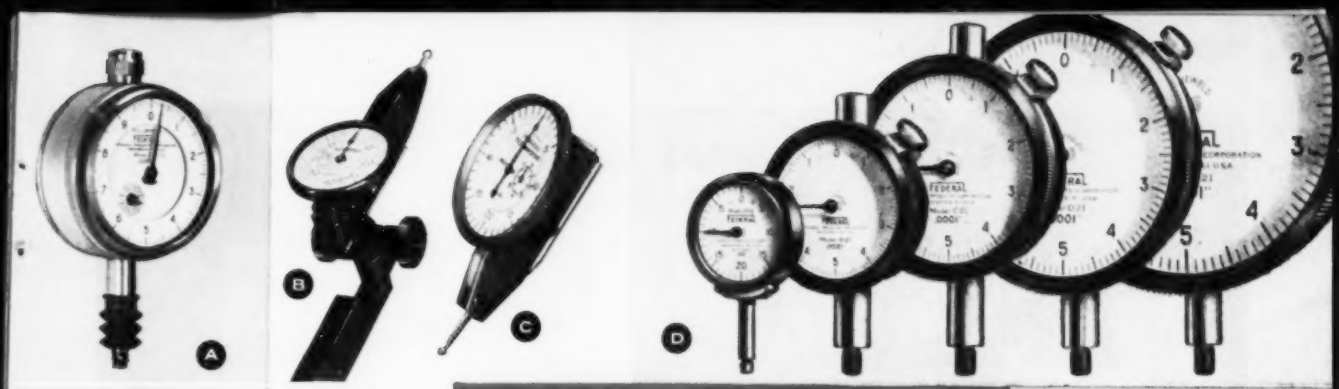
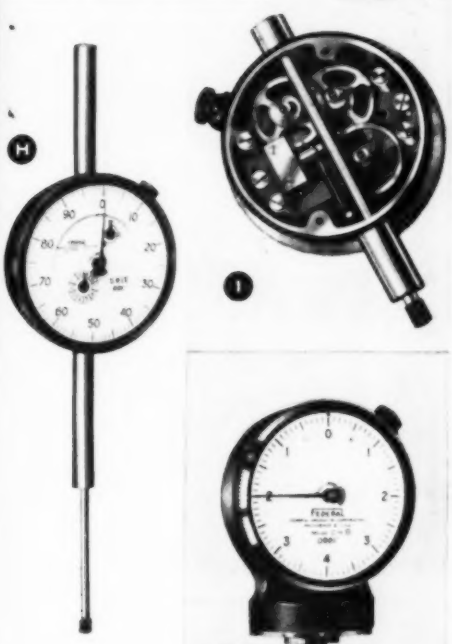


whatever you need in DIAL INDICATORS



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K **Dials** for any magnification. Also balanced, continuous, clockwise, counter-clockwise — with rev. counters, special markings, etc.

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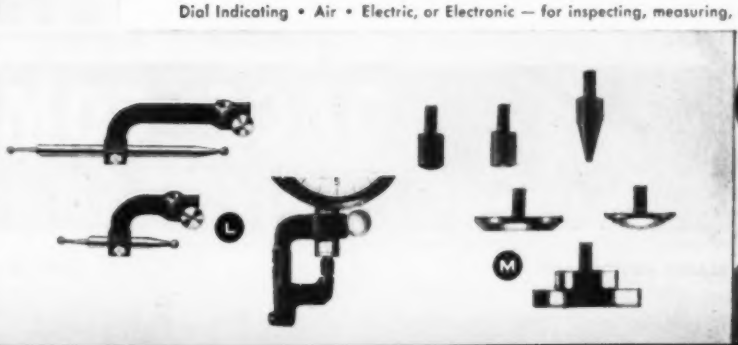

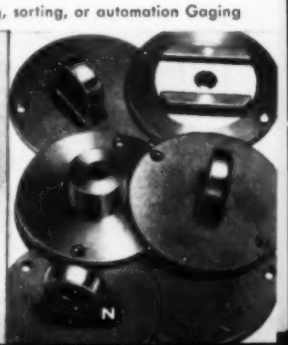

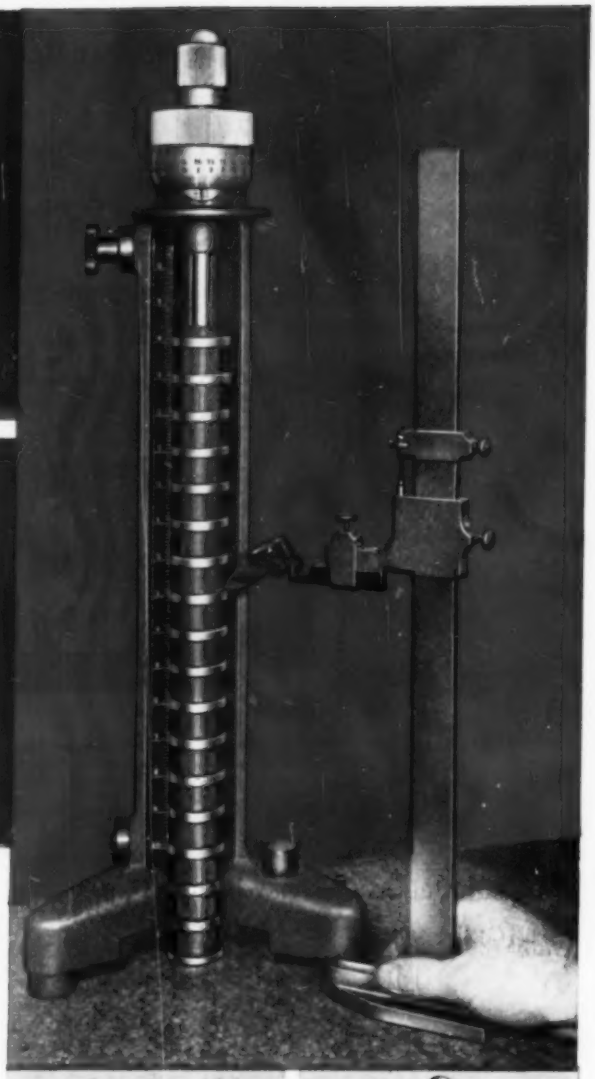

See How PLA-CHEK Cuts Inspections from Minutes to Seconds

Notice the wrist light photos above. Just a turn of the Micrometer thimble and PLA-CHEK is set. Far fewer motions, far less time . . . and guaranteed accuracy to .00005" throughout this PLA-CHEK'S entire range. No gage blocks or reference surfaces to touch—body heat can't affect it. Setting time 10 seconds . . . inspections in 1/5 the time of older methods. That speed and accuracy is being proved daily in thousands of installations throughout industry.

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PLA-CHEK Gages are available in a full range of sizes to meet every inspection or surface plate layout requirement. Models are: The easily portable 6" and 12" sizes and the 18" size (shown above) are guaranteed accurate to .00005" throughout their entire range, and the 24", the 36" and the 48" sizes are guaranteed accurate to .0001" in any 24" length or .0002" over their entire range.

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Built with the same precision as the gages themselves, PLA-CHEK Gage Risers may be used to extend the usefulness of every PLA-CHEK Gage from the smallest to the largest size. Available in 6" height for 6", 12", 18" PLA-CHEKS . . . 12" height for 24", 36", 48" models.

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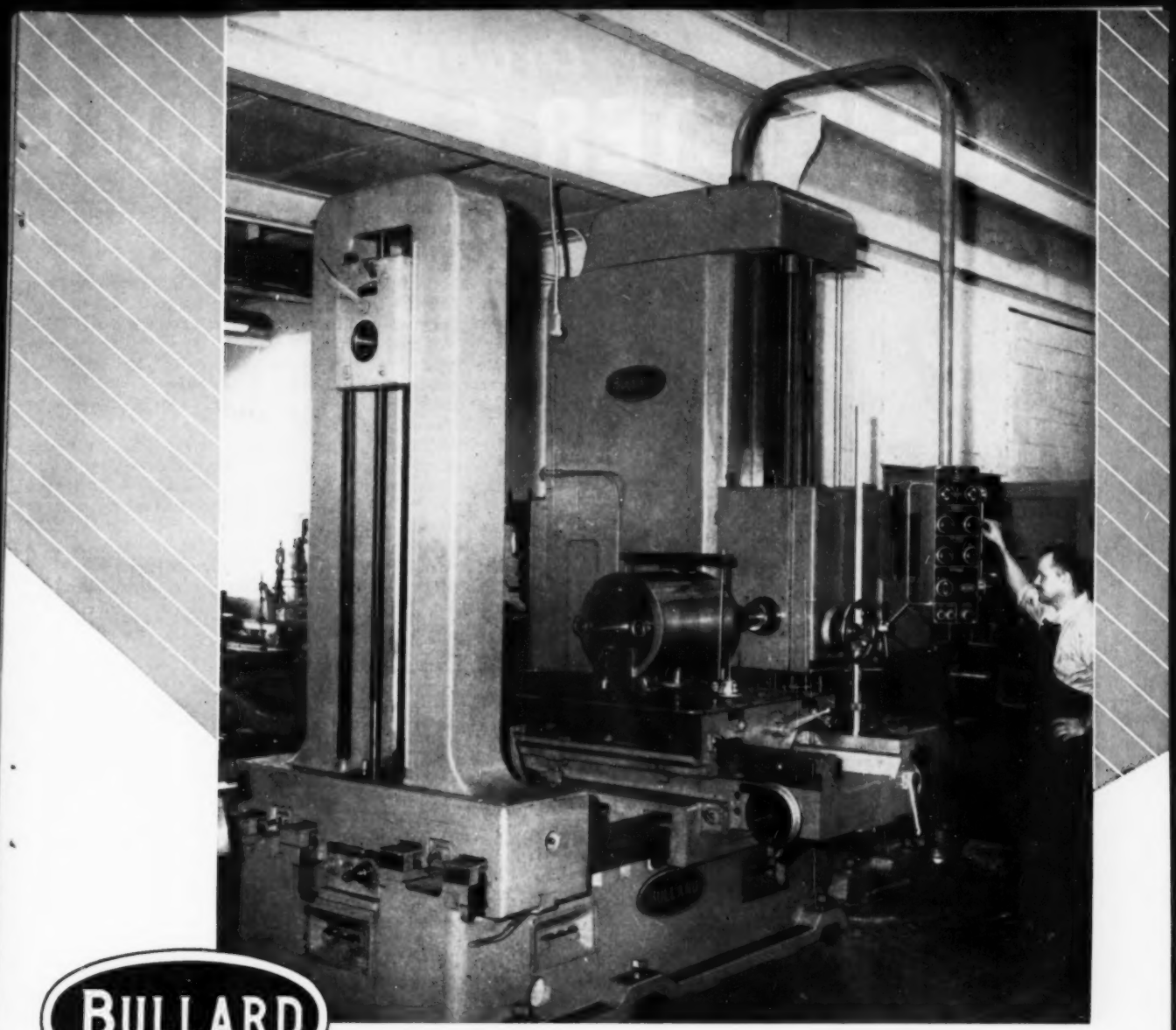
is graduated to .0001" and provides dimensions between 1" steps on measuring bar. Measuring bar of the 18" model (as illustrated) and larger models, can be adjusted to enable the user to take readings up or down relative to a center line or other reference line on the work.

Cadillac GAGE COMPANY

P. O. BOX 3806 • DETROIT 5, MICHIGAN



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"building special machinery for a wide segment of industry, we needed
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best met our requirements. Now, after more than two years of operation,
we're convinced we made the *right* choice and bought the *right* machine."

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300% Increase in Drilling Production

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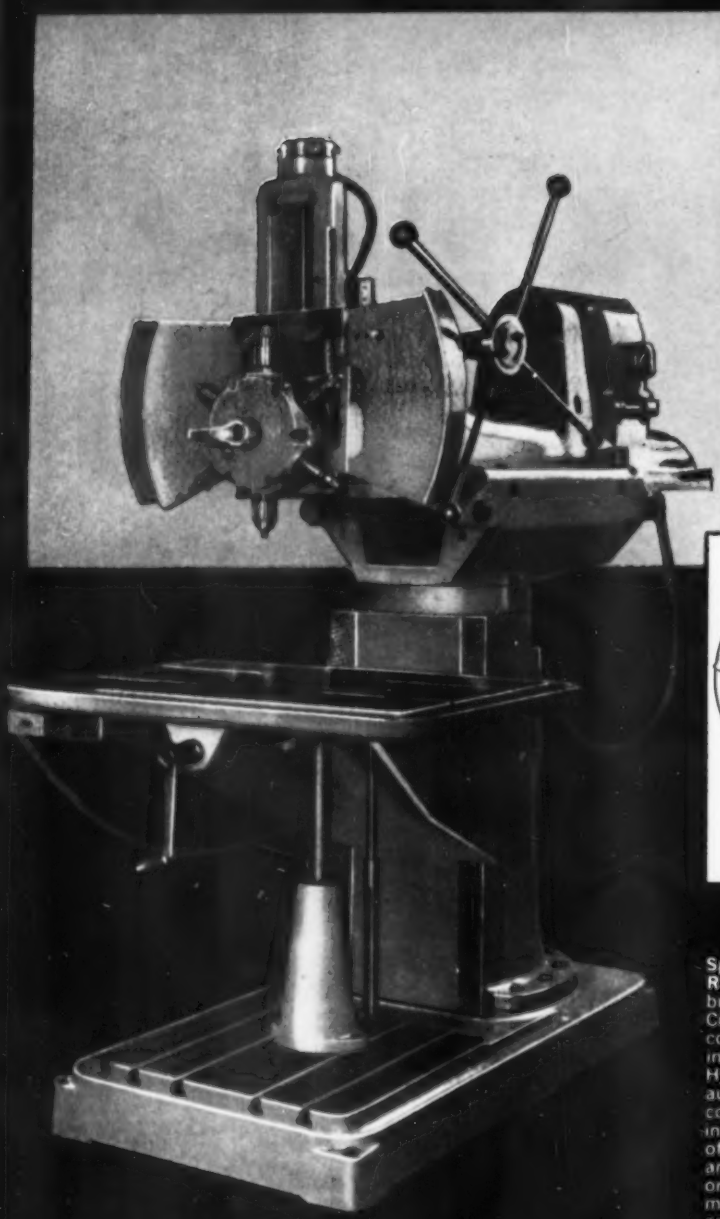
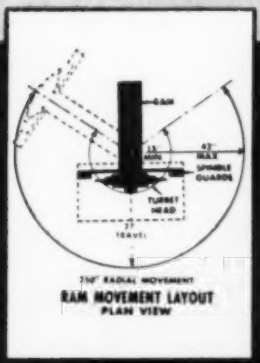


The use of six Burgmaster 6-spindle radial drills for machining of TERRIER MISSILE components has increased drilling, reaming, tapping and counterboring of complex parts in the Convair-Pomona operated facility by approximately 300% as compared to 4 or 6 spindle table drills. This substantial increase has been determined from an analysis of sixteen individual parts. These savings will result in the amortization of the equipment in 2.04 years.

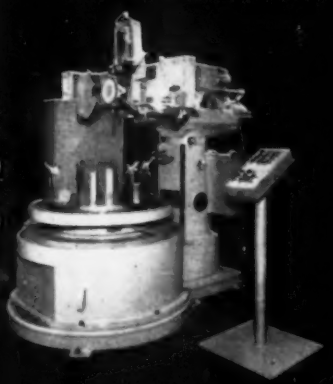
The radial turret drilling machines have simplified the multiple drilling operations by fast precision indexing of the multiple tooled turrets. Tool settings and cutting sequences are consistently and accurately repeated at maximum speed to realize substantial savings in operation time. On the hydraulic manifold alone a total of 96 operations is performed using ten different tools. Dimensional consistency and closer tolerances are achieved by the complete mechanization of the machining sequence.



RAM MOVEMENT LAYOUT
PLAN VIEW

250° Radial Movement. The radial drill sweeps a radius of 14" minimum to 42" maximum through 250° over a 24" deep x 36" long table. The ram rolls on large double row ball bearings and is easily controlled by one hand from the handle on the turret. A press of the thumb releases the air hydraulic clamping of the ram and cradle, permitting free and easy movement of the ram in any direction. Releasing the button clamps all units rigidly in place, after which the spindle can be advanced to perform a precision operation.

Special Automatic Hydraulic Radial Turret Drills can be built up from Standard Components and supplied as complete production units including Tools, Fixtures, and Hydraulic power. The machine automatically carries out a complete cycle of operations including approach and return of each tool, and indexing on any desired set of circular or radial centers. The flexible machine has adjustable stops and controls which permits fast set-ups for machining a variety of parts.



Specialists in High Production Turret Drilling

"O" Manual Power Index ¼" Capacity

1C Manual Power Index ⅜" Capacity

2B Manual Power Index ¾" Capacity

2BF Flange Mounted Power Index ¾" Capacity

2BH Automatic Hydraulic ¾" Capacity

3BH Automatic Hydraulic 1½" Capacity

2BR Ram Type Radial Drill ¾" Capacity

2BHT-3BHT Automatic Tape Controlled ¾" and 1½" Capacity

Pays for Equipment in 2.04 Years with
RADIAL TURRET DRILLS

Simplicity and Ease of Operation

The simplicity and ease with which the Burgmaster Radial Drill can be moved from one center to another, together with the 6-spindle automatic indexing turret which carries out a pre-planned sequence of operations, accounts for the savings. The turret is counterbalanced by an adjustable coil spring to make the turret weightless or for self returning to the top of stroke position. The machines have preselected spindle speeds varying from 125 RPM to 3000 RPM which permits operation at the most efficient speed for accuracy, finish, production and longest tool life. Accuracy is further assured by air hydraulic clamping of the ram slide and cradle, automatic turret clamping, and rigid micrometer depth control.

The advantages of this new method of machining Terrier Missile Manifolds can be further visualized when listing the various operations required, as follows:

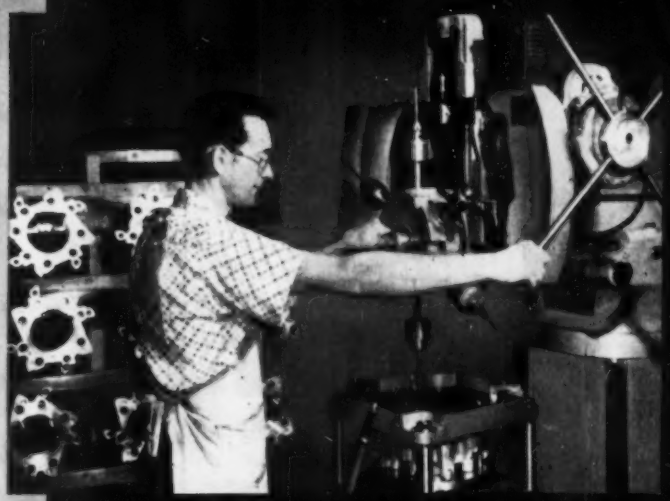
No. of Operations	Operations
24	Drill .2190 / .2113 dia. x .61 / .58 deep.
24	C'Sink 100° x .270 dia. Tap ¼-28 UNF-2B x .38 deep, min. perf. thds.
8	Drill .198 / .201 dia. x 1.015 max. depth. C'Sink 100° x .271 dia. Tap ¼-20 UNC-2B x .65 deep, min. perf. thds.
1	Drill .241 / .246 dia. x .580 deep. Ream .252 / .248 dia. x .540 deep.
8	Chamfer 45° x .030 deep.
4	Drill .381 / .374 dia. x 1.38 deep at 15° angle.
4	Drill .381 / .374 dia. at 30° angle to break thru. (56 deep ref.)
3	Drill .152 / .145 dia. x .600 deep. (max.).
4	Drill .152 / .145 dia. x .72 deep (max.). C'Sink 100° x .208 dia. Tap 10-24 NC—2B x .430 deep, min. perf. thds.
2	Drill .381 / .374 dia. thru.
1	Drill .338 / .336 dia. thru at 75° angle.
2	Drill .114 / .105 dia. x .91 deep (max.). C'Sink 100° x .168 dia. Tap 6-32 NC—2B x .35 deep, min. perf. thds.
3	Drill .206 / .196 dia. x .61 deep. (max.). C'Sink 100° x .273 dia. Tap ¼-20 NC—2B x .38 deep, min. perf. thds.
4	Drill .266 / .182 dia. x .80 deep C'Sink 100° x .30 dia. Tap ¼-20 NC—2B x .50 deep, min. perf. thds.
4	Drill .2037 / .2010 dia. thru. C'Sink 100° x .78 dia. Tap ¾-20 UNEF—2B thru.

Total Operations 96
Total Different Tools.....10

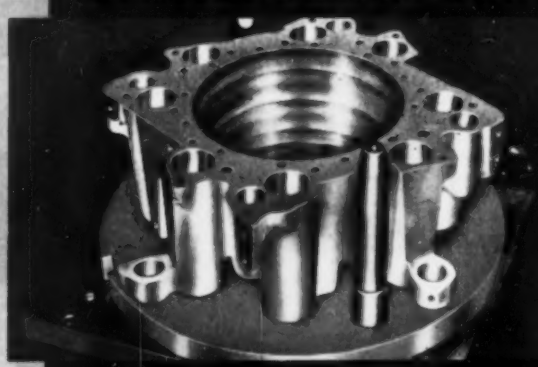
JOB FACTS

Machine.....Six Burgmaster 6-Spindle Radial Turret Drills
Part..... Hydraulic Manifold
Material ..... Aluminum
Total Operations 96
No. of Different Tools.....10
Lot Sizes .....1 - 20
Number of Types.....1
Accuracy.....±.002 to ±.005 and .004 True Position
Fixture.....Special Fixtures with Drill Bushings
Former Method.....4 and 6 Spindle Table Drills
Former Time.....1½ Hours
Present Time .....½ Hour

PRODUCTION INCREASED BY 3 TIMES



One of the SIX Burgmaster Radial Turret Drills used for Drilling, Countersinking, Tapping, Drill-Heli-Coil Tapping, and Reaming Operations on Terrier Missile Hydraulic Manifolds at Convair (Pomona), a Division of General Dynamics Corporation.



The completed Terrier Missile Hydraulic Manifold showing some of the 96 operations which utilize ten different tools to produce.

Write for bulletin describing Burgmaster 6-Spindle Radial Drills in detail; also 20-minute 16MM sound film showing Burgmaster Turret Drills in operation, including the new Automatic Tape Controlled Machine, available from any office.

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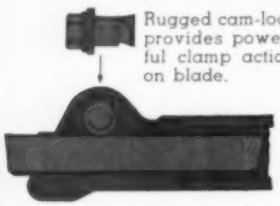
MORE THAN MEETS THE EYE!

FOR INSTANCE

Here are two examples typical of Williams cost-saving features.

WILLIAMS CUTTING-OFF AND SIDE TOOL HOLDERS



Rugged cam-lock provides powerful clamp action on blade.

SIZE FOR SIZE SAME HOLDER TAKES BOTH STANDARD CUTTING-OFF BLADE AND SIDE TOOL BLADE. ONE HOLDER DOES THE WORK OF TWO. TOOL INVESTMENT IS CUT IN HALF.

WILLIAMS BORING TOOL HOLDERS

EACH HOLDER TAKES MANY SIZES OF BARS WITHOUT THE USE OF SLEEVES OR BUSHINGS WHICH CAN LEAD TO SPRING AND CHATTER.

V-BLOCK CONSTRUCTION PREVENTS CHATTERING SINCE BARS ARE GRIPPED AT FOUR POINTS AND CANNOT MOVE VERTICALLY OR HORIZONTALLY.

LOOK behind the performance of any Williams Tool Holder and you will find one or more superior features which make the big difference in rigidity and versatility ... that save so many machine shop dollars.

Buy Williams BETTER TOOLS FOR BETTER WORK from Catalog 303

FOR PROMPT, PERSONAL SERVICE — CALL YOUR LOCAL DISTRIBUTOR

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DROP FORGED
TOOLS OF INDUSTRY

J. H. WILLIAMS & CO.
DIVISION OF UNITED-GREENFIELD CORPORATION
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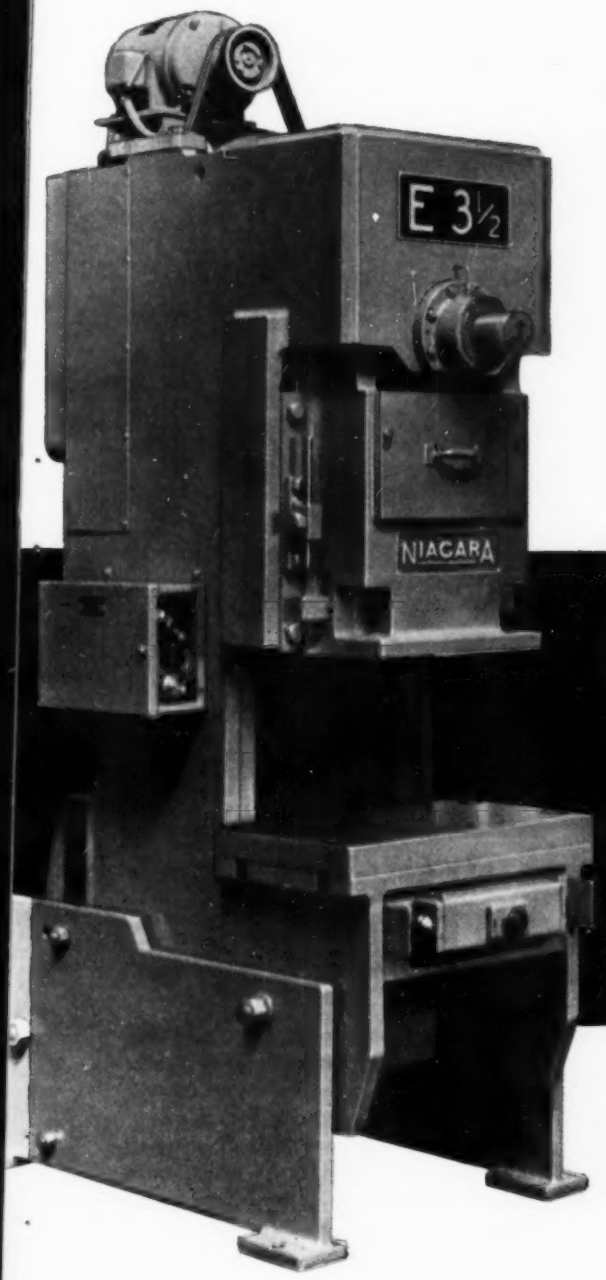
NEW! ULTRA-MODERN 45-TON OBI

added to Niagara's exclusive front-to-back crankshaft series



READY FOR YOU

. . . a brand new addition to industry's most advanced line of OBI's! Years ahead of any press within its range, this 45-ton newcomer is available plain or geared. The front-to-back arrangement of its 3½" crankshaft is, of course, a distinguishing mark of Niagara's famous Series E.

No other OBI press design has been so widely acclaimed. And no wonder . . . for no other OBI boasts so many unique advantages:

Full support to wide dies. Greater resistance to off-center loading. Accurate alignment of slide with minimized tendency to cock. Crankshaft deflection minimized. Substantially increased die life. Smoother, safer performance. Exposed overhanging gears, flywheel and other mechanisms eliminated. Less floor space.

GET THE FULL STORY on this new 45-ton wonder-worker as well as the 4 other sizes in the Series E family (up thru 200-ton capacities, and 7½" shaft diameters, standard and automated models). Write for illustrated Bulletin 56.

NIAGARA MACHINE & TOOL WORKS, BUFFALO 11, N. Y.

- Rigid crankshaft with close coupled main bearings each side of crank pin.
- Widest spaced OBI gibbing (L to R) in the industry permits wider box section slide to rigidly support a greater slide face area of full JIC dimensions. Guiding of slide is closer to point of die operation because there is no flange interference with gibbing.
- Longest gibbing in the industry, exclusive multiple "V" type, provides the most efficient guiding and accurate alignment of slide for greatest die life.
- Fully concealed, yet readily accessible, driving mechanism.
- Enclosed, rigidly supported gearing operates in sealed oil bath.
- Low inertia, pneumatic friction clutch and brake operate directly on crankshaft — the slowest rotating shaft.
- Precision, hardened, longer-wearing steel gears.
- Rigid, compact all-steel, box type frame.
- Power slide adjustment and power inclining device operate with new, unequaled speed.

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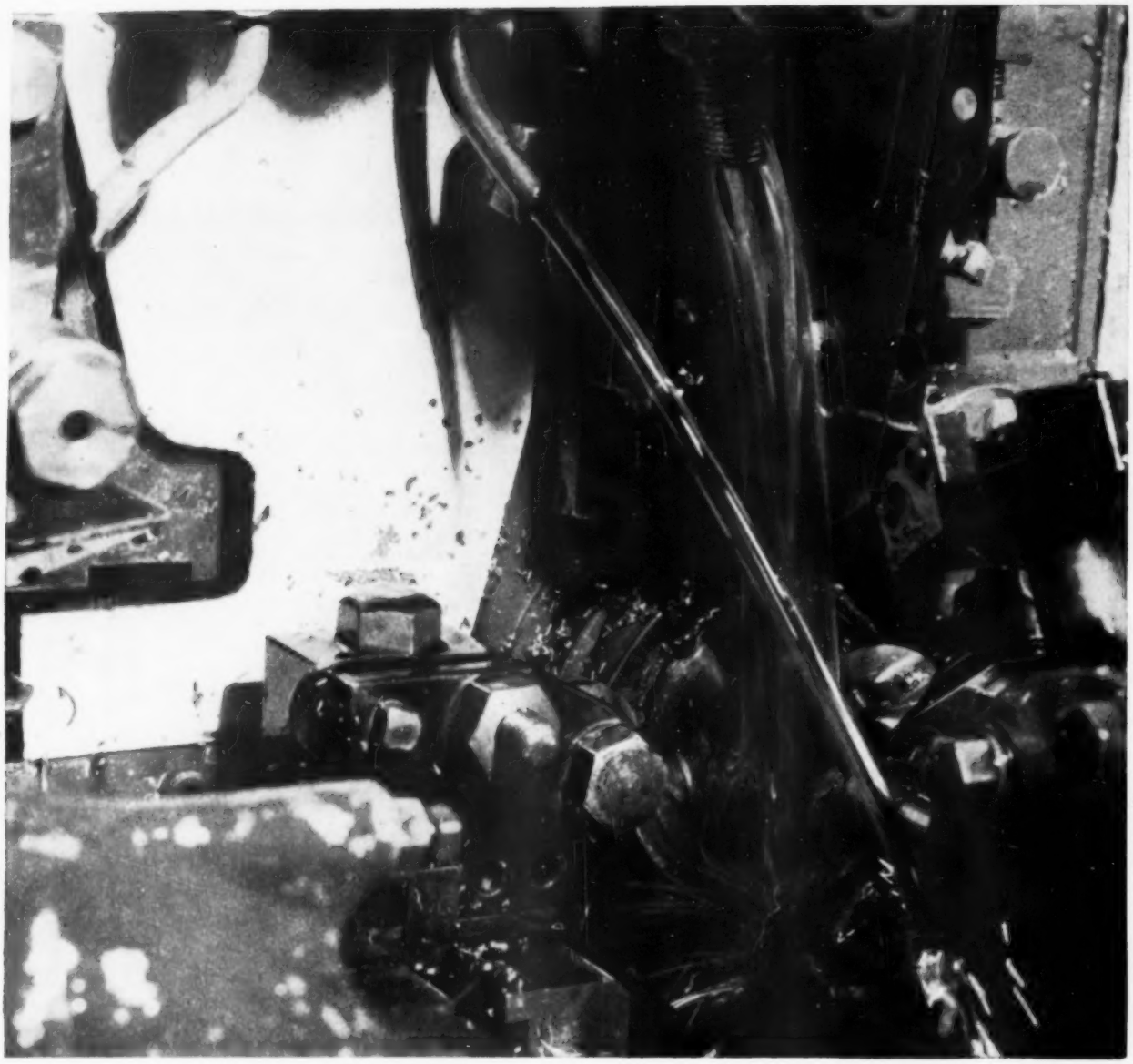
CIRCLE 215 READER SERVICE CARD



Holds tolerances of .0005 on stainless steel . . . cuts time

GULF MAKES THINGS

"Quite often we are required to hold to tolerances of .0005 on stainless steel in both automatic and hand screw machines," reports Wallace J. Perzanoski, Foreman of the Screw Machine Department, Cramer Controls Corporation, Centerbrook, Connecticut.

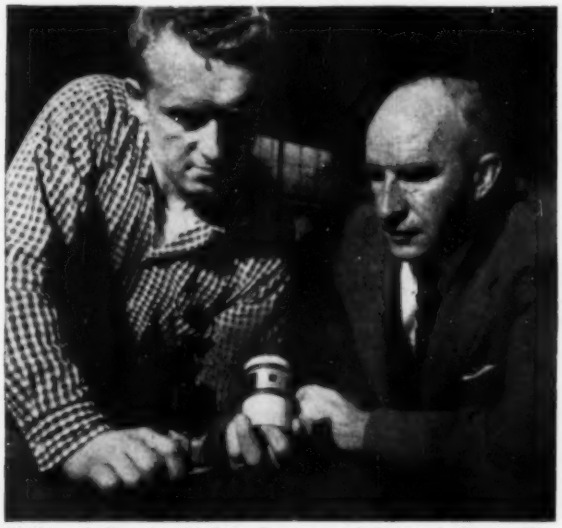
"The two cutting oils we now use . . . Gulfcut 41C for stainless steel and bronze, and Gulfcut 31A for regular brass and cold rolled steel . . . help us hold to critical tolerances. Moreover, we have shortened the time cycle on some jobs by 25 per cent," he added.

Cramer makes synchronous timing motors and precision electrical timers for commercial, industrial and military uses. Cramer's line of internal timers, time delay relays and others must meet the most critical specifications for structural and operating accuracy.

A typical precision job at Cramer is the machining of pinion posts for hermetically sealed timers which must meet rigid military specifications. Machining—on a Brown & Sharpe automatic—includes feed, rough turn, finish turn, form, cutoff and slotting.

Several years ago, Mr. Perzanoski's department was using 7 or 8 different cutting oils. After consultation

Precision machined pinion posts made by Cramer for Type 430H hermetically sealed timers. Piece is of 303 stainless steel, ½ inch long. Machining time 25 seconds per piece. Gulfcut 41C helps speed up this operation.



Wallace J. Perzanoski, left, Foreman of Cramer's Screw Machine Department, checks a timer part with B. F. Kimball, Gulf Sales Engineer. Gulfcut Cutting Oils help Mr. Perzanoski get finer finishes, closer tolerances, at higher speeds.

cycle 25% using Gulfcut . . .

RUN BETTER!

with a Gulf Sales Engineer, they reduced this to two Gulfcut oils, 41C and 31A. These two versatile oils serve for their complete range of tough machining jobs.

"Another feature of these Gulfcut Cutting Oils that our operators appreciate is the non-staining characteristic which makes them easier and cleaner to work with," said Mr. Perzanoski.

How about *your* cutting oil performance? See how Gulf makes things run better in your operation. Just call the Gulf Sales Engineer at your nearest Gulf office, or mail the coupon.

GULF

GULF OIL CORPORATION
Dept. DM, Gulf Bldg., Pittsburgh 30, Pa.

Send me more information on:
☐ Gulfcut "Regular" Cutting Oils
☐ Gulfcut Heavy Duty Soluble Oils

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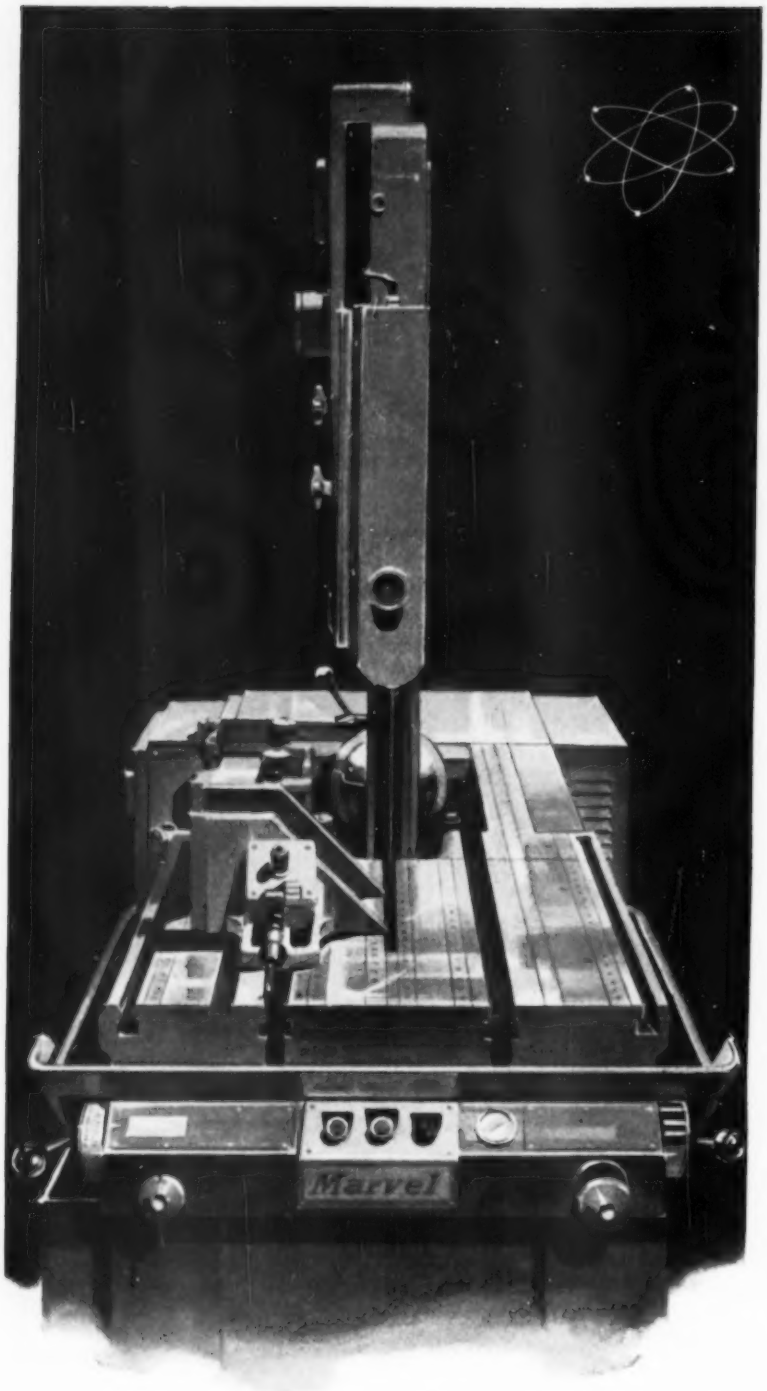


A goal we set many years ago has been reached.

When MARVEL decided to produce a heavy duty production band sawing machine, we were determined to bring out the most advanced, the most efficient band saw that it would be possible to produce . . . regardless of the cost in research, invention, and truly "new" design.

We were not interested in producing a band saw that would be only "as good" or "equal", or even "similar" to other machines already on the market. The new MARVEL Band Saw would have to be a superior machine—years ahead in design and performance . . . and its design must solve problems that have constantly challenged band saw builders and users alike:

Improve Band Sawing Accuracy . . . Extend Band Blade Life . . . and Reduce Cost Per Cut to the Minimum.

The recent introduction of the MARVEL No. 81 Series Heavy Duty Universal Hydraulic Band Saw Machines, specifically designed for use with high speed steel band blades, and equipped with a MARVEL invention—the "Sure-Line" Automatic Blade Control*—is *THE* major technical development in metal band sawing during the 20th Century.

The MARVEL "Sure-Line" Automatic Blade Control is an electro-mechanical servo-mechanism that continuously senses and automatically corrects any tendency of a band blade to cut inaccurately. The "Sure-Line" unit literally "steers" the blade to make it cut in a straight line.

Because of this exclusive feature, MARVEL No. 81 Single Cut, and No. 81A Automatic Bar Feed Band saws are the only modern band sawing machines capable of fully utilizing all the advantages of high speed steel band blades. Heavier feed pressures and higher blade speeds can be safely applied with complete assurance that the accuracy of cut will not be impaired. This leads to much faster production.

For this—and many other reasons, the new MARVEL No. 81 Series Band Sawing Machines are literally *Tomorrow's Saws Today!* Why not write for full details now?

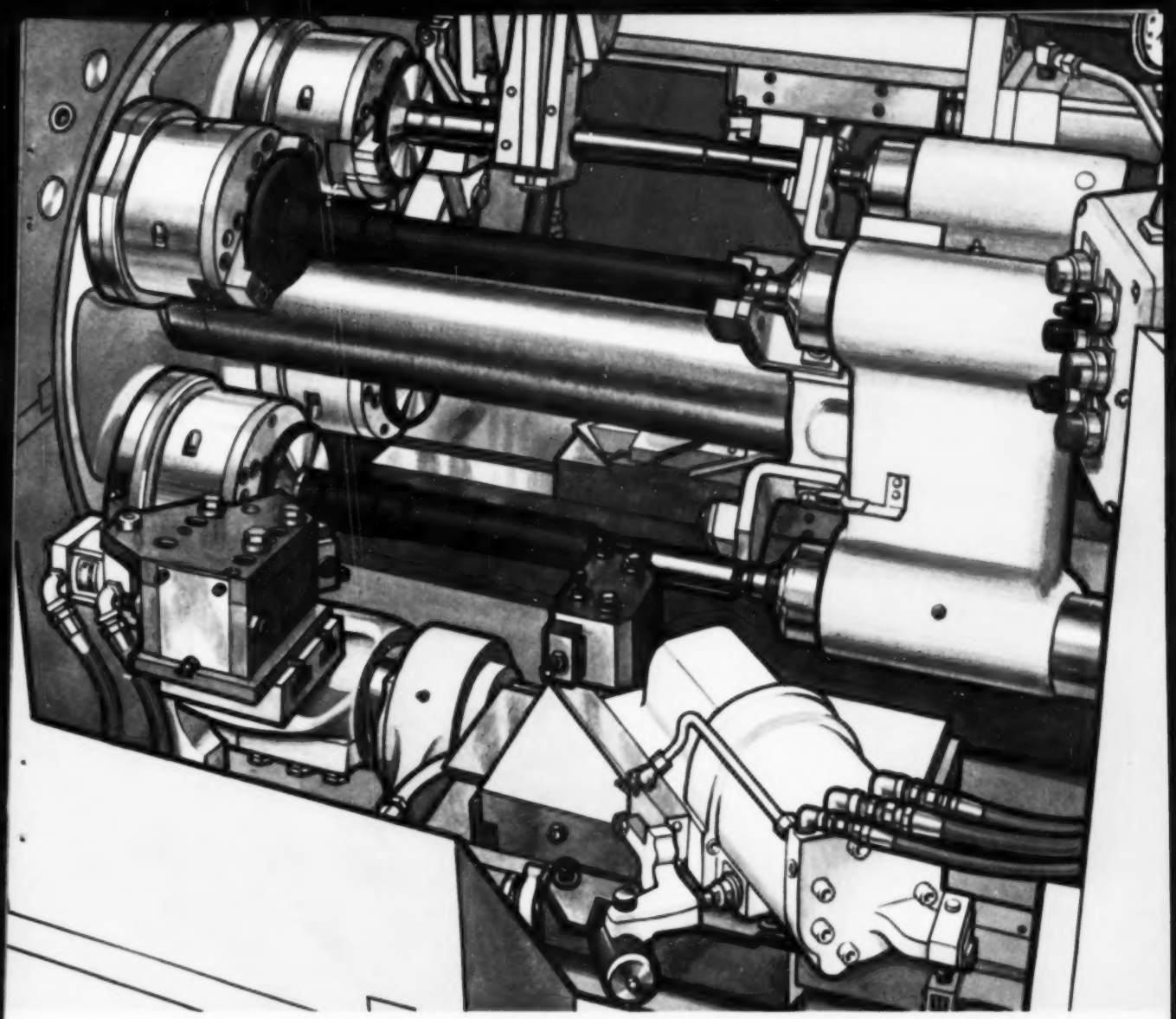
*BASIC PATENT APPLIED FOR

FROM MARVEL...

TOMORROW'S SAW TODAY!

ARMSTRONG-BLUM MFG. CO. • 5700 W. BLOOMINGDALE AVE. • CHICAGO 39, ILL.

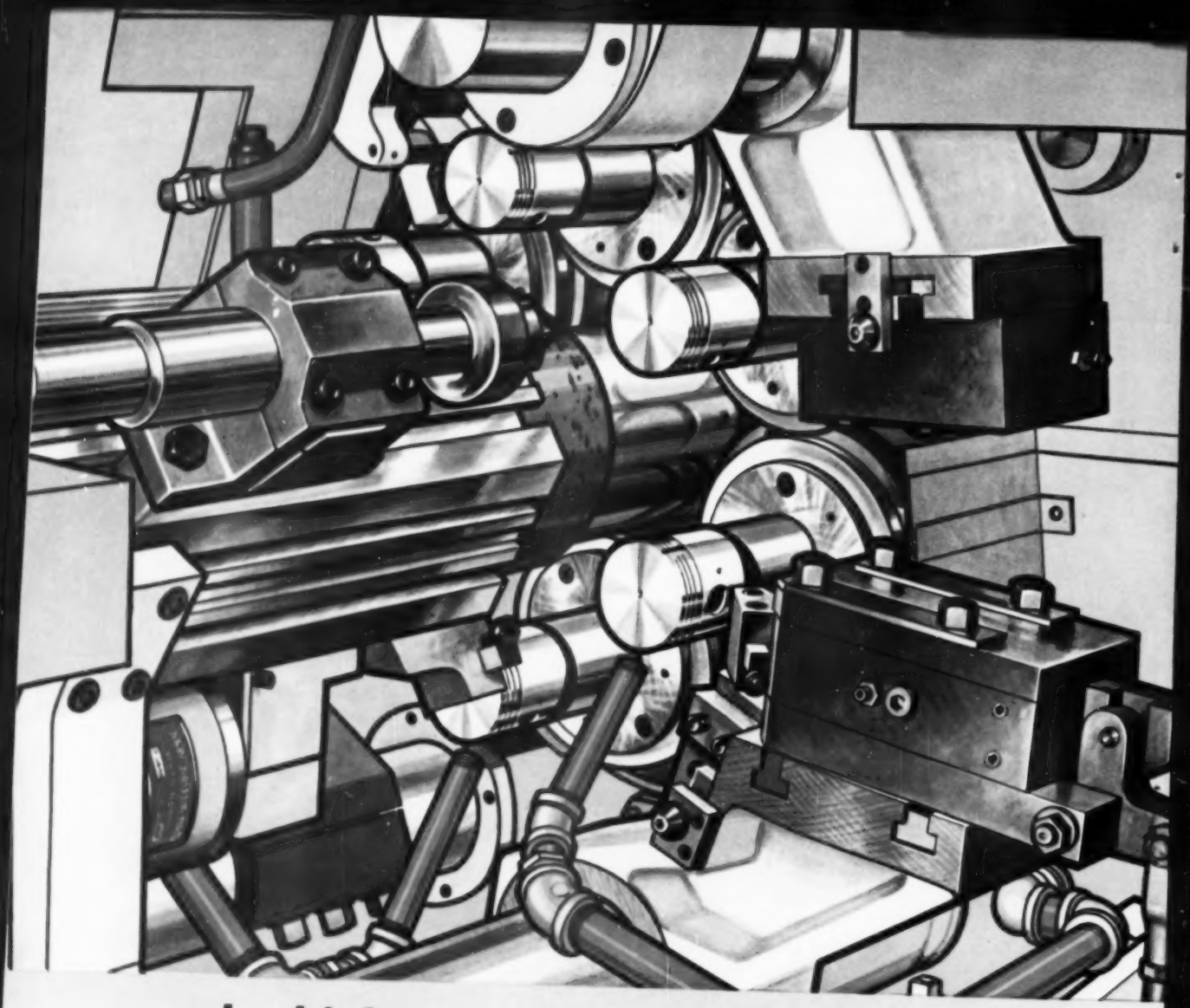
MARVEL Metal Cutting SAWS
Better Machines—Better Blades



copy more than three times faster on New Britain 4-spindle copying lathe

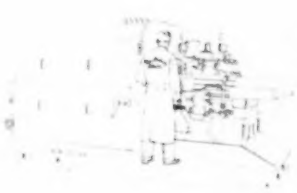
For the first time... multiple spindle copy turning. Loading station and three work stations. Work chucked between centers which index together. Template-controlled hydraulic slides perform copy turning; cross slides and/or forming arms perform a wide variety of additional operations. Two-speed spindles, automatic loading and unloading, and automatic chip conveyor optional. The New Britain Machine Company, New Britain-Gridley Machine Division, New Britain, Connecticut.

Model 412/25 Copying Lathe



make higher production pay for itself

A New Britain four-, six- or eight-spindle chucker with open-end design, massive forming arms, large capacity (up to 15") will machine your castings and forgings faster at less cost. You can measure it in *income* instead of *cost* because New Britain Chuckers pay as they go. New Britain's new financing plan makes large initial investment unnecessary. New Britain-Gridley Machine Division, The New Britain Machine Company, New Britain, Connecticut.

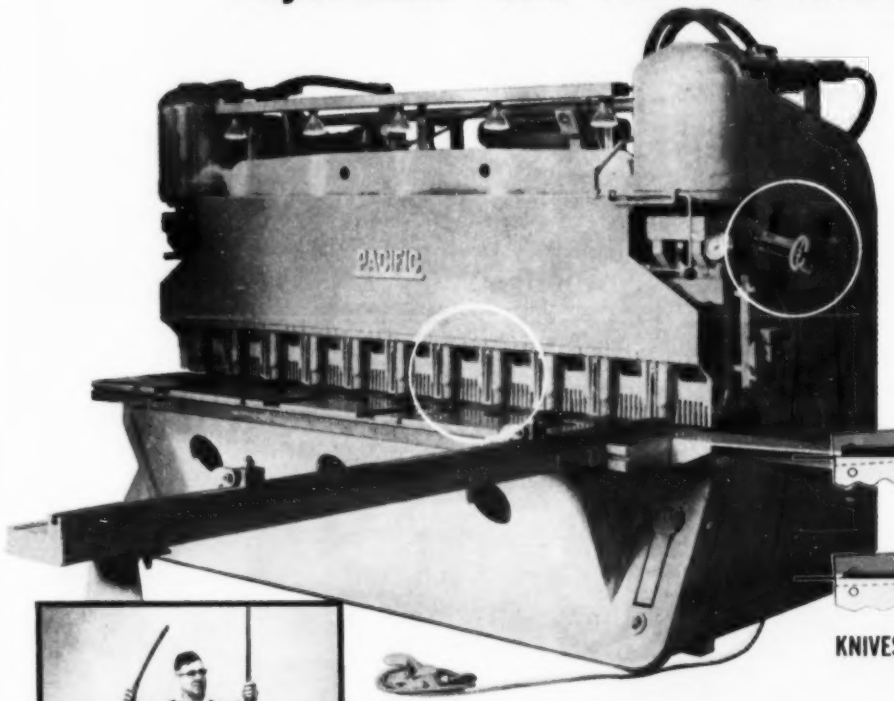


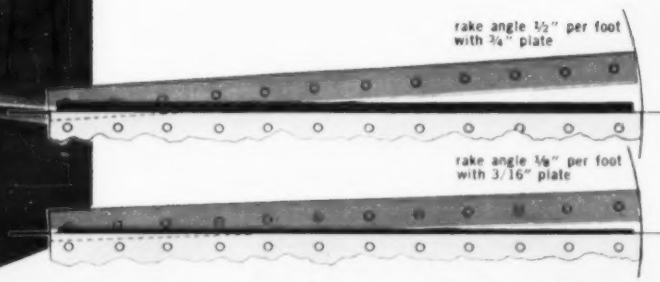
NEW BRITAIN CHUCKING MACHINE

◀ CIRCLE 220 READER SERVICE CARD

Adjustable rake PACIFIC HYDRAULIC SHEAR...

the single shear that produces highest quality cuts on both light and heavy metals.





Rake angle adjustable to match plate thickness

KNIVES STAY SHARP UP TO A YEAR OR MORE OF CUTTING 8 HOURS A DAY

Cuts up to 60 strokes per minute with minimum twist, bow and camber.

Left, 1/4" plate cut with maximum rake angle. Right, 1/4" plate cut with minimum rake angle.

Adjustable rake Pacific does the work of 2 or 3 conventional shears. It saves capital investment, valuable floor area and costs less to install. Heavy duty Pacific pays for itself out of operational savings . . . it takes fewer hands to operate, makes better cuts, requires little or no maintenance, virtually eliminates production downtime.

A Pacific shear for your heaviest cutting eliminates the wasteful expense of slow, costly burning. Powered hydraulically, Pacific cuts with a shockless, cushioned stroke . . . knives stay sharp longer saving cost of regrinding or replacement. Recurring costly downtime for turning or changing knives monthly is practically eliminated. Pacific is "quiet as a sewing machine" . . . it encourages greater efficiency from workers in plant or office.

Write for circular

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CIRCLE 221 READER SERVICE CARD

peeling machine

hot ingot

INNOCENTI

INNOCENTI CORPORATION, 45 Columbus Avenue
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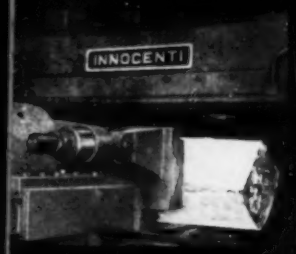
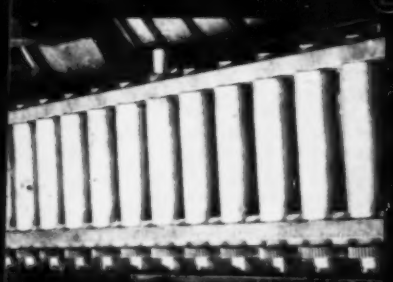
CIRCLE 222 READER SERVICE CARD

works in milan (italy)



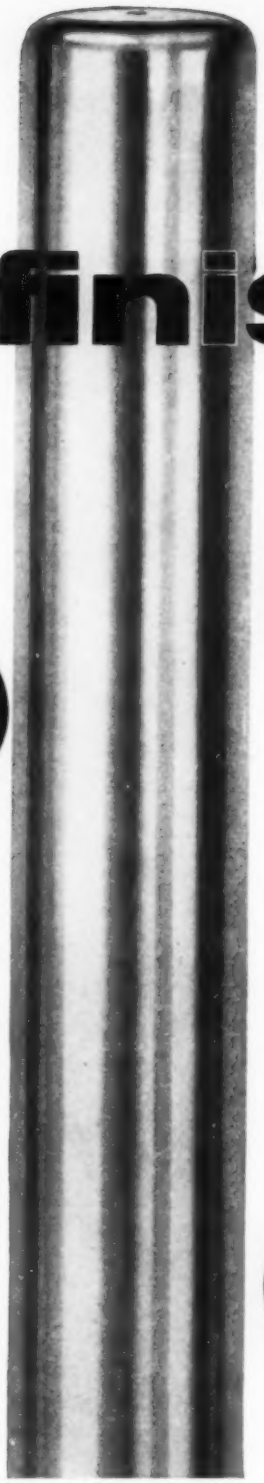


The hot ingot peeling performed with the special Innocenti milling machine eliminates all the inconveniences connected with the old manual and mechanical systems. The hot milling of the scale by means of a controlled peeling operation affords a technically perfect result which is also economically advantageous. The complete cooling of the ingot between stripping and conditioning is eliminated together with the cracking danger and the annealing necessary to bring the ingot to rolling temperature. After the stripping, the ingot goes to the milling position where is peeled on one side. A manipulator turns over the ingot until all sides one after the other have been peeled. The ingot returns to roller table and thereafter goes to the soaking pits and the roughing mill. The machine is operated automatically; hydraulic controls and safety devices allow a safe and practical use. All types of carbon, alloy and stainless steel can be conditioned without changes in working time. This represents a noticeable improvement as compared with the old systems where the conditioning of alloy ingots was from 2 to 10 times longer than the basic time allowed for carbon steel.

ALL SUPERIOR
DIE SETS HAVE

Superfinish

GUIDE PINS



HIGH LUSTRE MICROFINISH (2-5 MICRO INCHES)

MAXIMUM SURFACE HARDNESS

INCREASED BEARING SURFACE

LONGER PIN AND BUSHING LIFE

GREATLY REDUCES POSSIBILITY OF SCORING

The process of Super Finishing removes the soft outer skin (approx. .0002-.0003) caused by the heat induced as a result of grinding.

Super Finish eliminates charging which is common to pins lapped with an abrasive compound.

Super Finishing, long a prerequisite in the Automotive and Aircraft Industry for precision bearing surfaces, is now a standard on Superior guide pins. With Super Finished guide pins ideal clearances can be maintained due to a greater bearing surface.

Write for the NEW 28 page Superior Catalog Today!!

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Mitchell 5-6027
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This man knows how to use the "Touch of Gold"

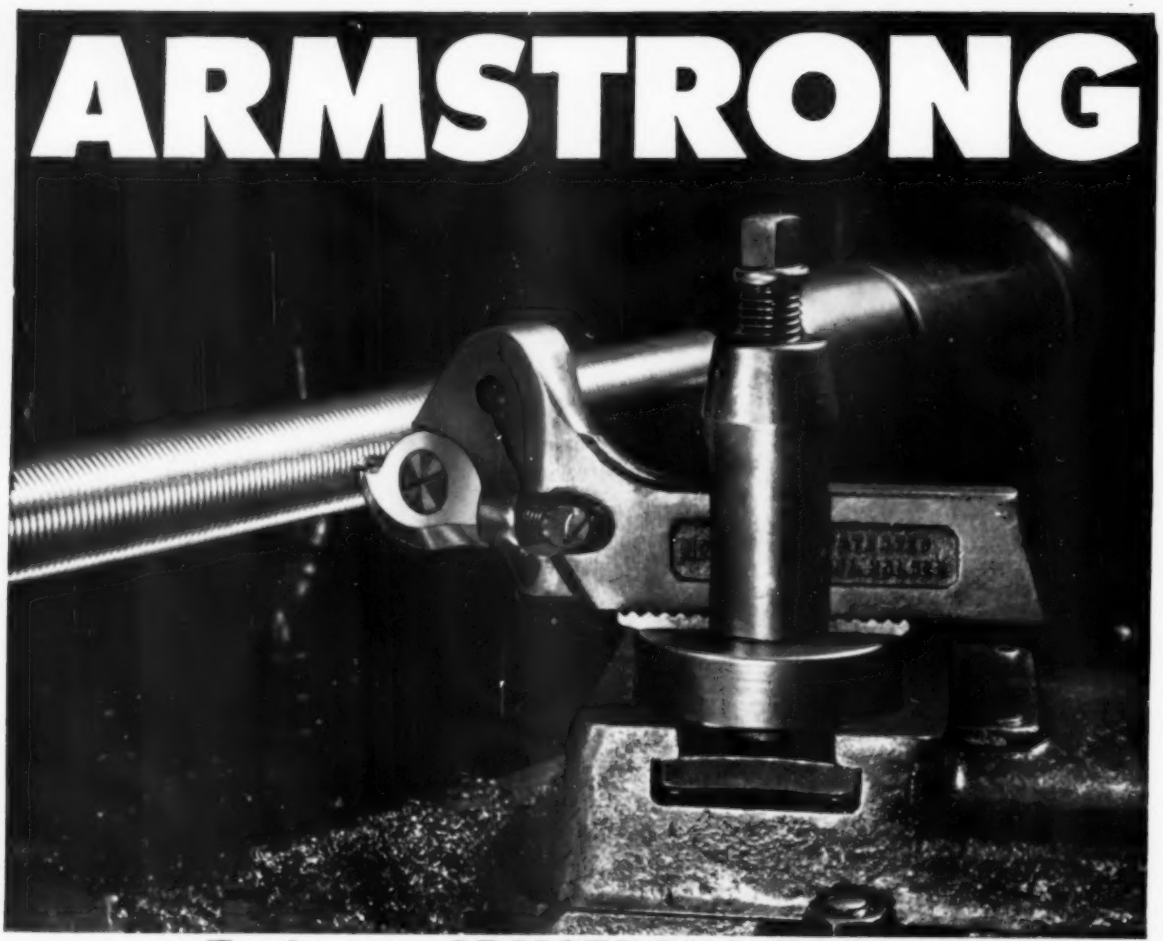
He is bringing a product closer to its finished state, adding the "Touch of Gold" by using exactly the correct Norton reinforced wheel to do the best job. To help you bring this value-adding benefit to your product there are many types of Norton reinforced wheels, using different types of reinforcement . . . glass cloth, nylon, cotton and combinations of them. There are resinoid and rubber bonds . . . straight and depressed-center shapes for every grinding, cutting off or slotting job where you need reinforced wheels. And every wheel is a product of Norton research.

Your Norton Man can bring these "Touch of Gold" benefits to your production. He is a qualified abrasive engineer with broad, practical experience that is backed by Norton's complete line of abrasive products and world-wide resources and services. He can save you production time and money. Call your Norton Man. NORTON COMPANY, General Offices, Worcester 6, Massachusetts.

NORTON
ABRASIVES

Making better products...to make your products better

ARMSTRONG



The ARMSTRONG Threading Tool takes interchangeable high speed steel form-cutters which require only flat top grinding to resharpen — always hold their true thread form.

Write for catalog

Each year ARMSTRONG TOOL HOLDERS become more important to you

Every rise in labor costs, every added tax, every overhead burden, every increase in cutting steel prices, every new, more costly machine tool, all increase the importance of ARMSTRONG TOOL HOLDERS to profitable operation.

ARMSTRONG TOOL HOLDERS reduce direct tooling costs to an absolute minimum—"Save: All Forging, 70% Grinding, 90% High Speed Steel."

ARMSTRONG TOOL HOLDERS reduce tooling-up time to minutes, to the selection and adjustment of the holder and cutter.

ARMSTRONG TOOL HOLDERS permit increased speeds and feeds —produce more pieces per hour per machine tool.

ARMSTRONG TOOL HOLDERS are efficient for they embody a perfection gained by over 50 years of specialization in the development and refinement of tool holders.

ARMSTRONG TOOL HOLDERS are inexpensive because they are quantity produced by modern methods, for a world market . . . are used by over 96% of the machine shops and tool rooms . . . are carried in stock for your convenience by all industrial distributors of consequence.

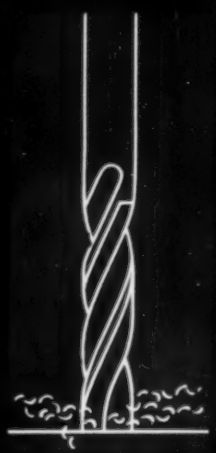
Buy **ARMSTRONG TOOLS** from your Industrial Distributor

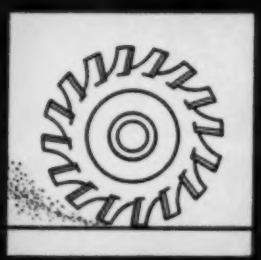
ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"
5215 W. ARMSTRONG AVENUE, CHICAGO 46, ILL.

CIRCLE 226 READER SERVICE CARD

CIRCLE 227 READER SERVICE CARD ▶





vega air-hardening tool and die steel is the easiest to machine of all air-hardening tool steels. Vega was specially developed by Carpenter to combine toughness and the machining properties of an oil-hardening steel with the safety in hardening of an air-hardening grade. It is safe to harden and even intricate dies with many cutouts, sharp corners and thin sections come through heat treatment with outstanding freedom from distortion and size change. Call your local Carpenter Service-Center for immediate delivery from complete stocks.

the *Carpenter* Steel Company, Reading, Pa.

Quality made them

the choice of

Production

Supreme BRAND

Chucks

DELIVERY AND SERVICE
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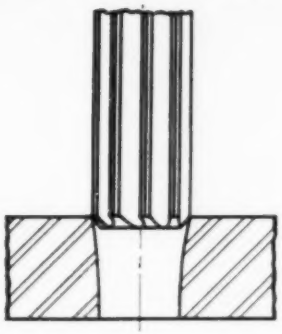
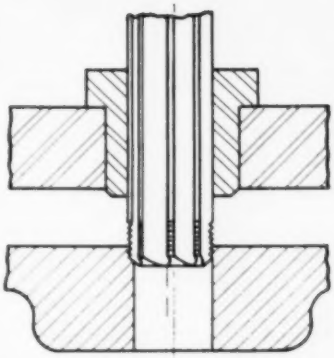
REAMING TIPS YOU CAN USE



When a hole is to be reamed, check handbook recommendations on size of drill to use. A reamer works best, and lasts longer, when there is adequate stock left for reaming. Avoid tapered or bell-mouthed holes (caused by improper drilling) that cause excessive reamer wear.

Protect reamers at all times. The chamfers or cutting edges and the accurately ground surfaces of the margins will be damaged if mishandled. Good shop practice is to save the sturdy tubes in which the reamers were originally packed. When not in use, keep reamer in its own labeled tube.



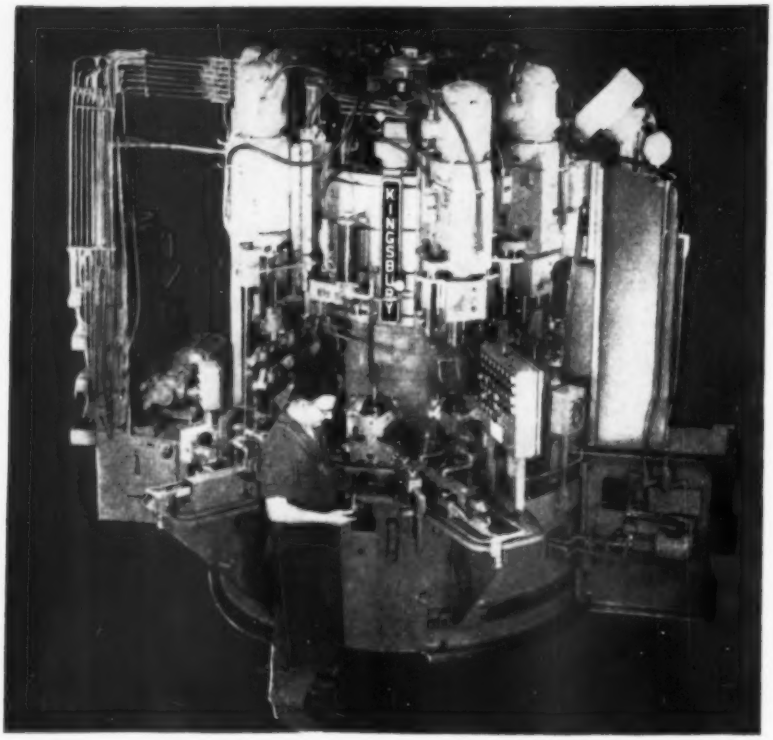
Misalignment between the reamer and the drilled hole can create two problems: 1. Wear on the reamer that takes the form of a thread . . . with depth equal to amount of misalignment; 2. Poor finish in reamed hole. Always check alignment of drilling and reaming fixtures.

FOR QUICK SOLUTIONS TO **ALL** YOUR DRILLING-REAMING PROBLEMS,
SEE CHICAGO-LATROBE CATALOG No. 58, OR CONSULT A C-L SERVICE ENGINEER

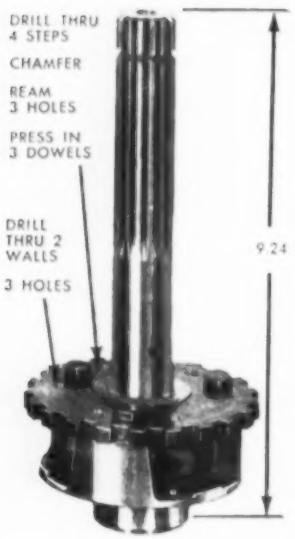
BEST TIP OF ALL . . .

CHICAGO-LATROBE 416 W. ONTARIO ST., CHICAGO 10, ILLINOIS

CIRCLE 229 READER SERVICE CARD 63



New 24-spindle Kingsbury has hydraulic slides, dowel presser



STEEL SHAFT ASSEMBLY FOR AUTOMATIC TRANSMISSION

At a gross rate of 210 parts an hour, eight vertical 3-spindle units on the center column operate on this shaft. To clear the stem of the work as it indexes, hydraulic slides raise these units 5.5 inches from their operating positions. The movement takes one second each way and has a smooth harmonic motion. Cams in the units feed the tools 2.7 to 3.5 inches more as required.

A dowel pressing unit is at the right. The operator loads dowels into the hopper at the top. Three dowels are fed down different tubes and are pressed into the work. At the previous station the work is washed clean of chips.

A 63-inch index table holds 12 work fixtures with power clamping and unclamping.

Real production without trouble. Production men praise our machines because they really produce and give little trouble. The main reasons are good basic design and rugged, accurate construction. If you have a job for a multi-unit automatic and can't afford to live with it day after day to make it work, consider a Kingsbury. It will pay off. Kingsbury Machine Tool Corp., Keene, New Hampshire.

KINGSBURY MULTI-UNIT AUTOMATICS

Kingsburys make money on simple jobs too

PUMP PULLEY FOR AUTOMATIC WASHER

This simple machine makes money for the Maytag Co. by producing at a gross rate of 590 parts per hour with almost no downtime or rejects.

A 15-inch index table holds four work fixtures with manual clamping and unclamping. Four horizontal units drill and tap two holes. Bushings guide the drills for accuracy.

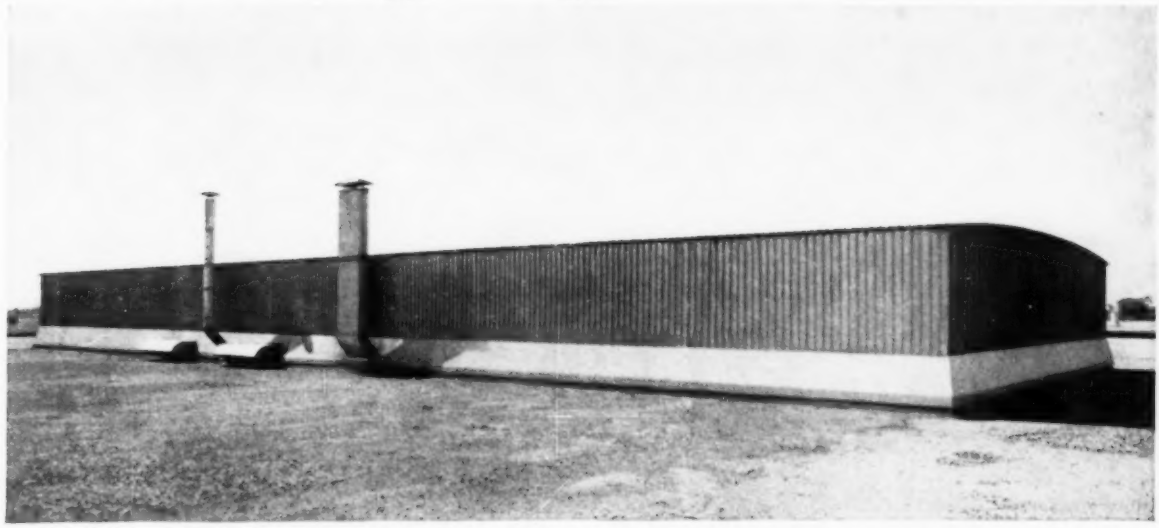
Typical Kingsbury jobs in eleven industries

These parts are used in a ball bearing, automatic transmission, door set, engine, generator, air conditioner, electric shaver, valve, aircraft engine, control instrument and rifle. All cost less on Kingsburys.

20 Distributors

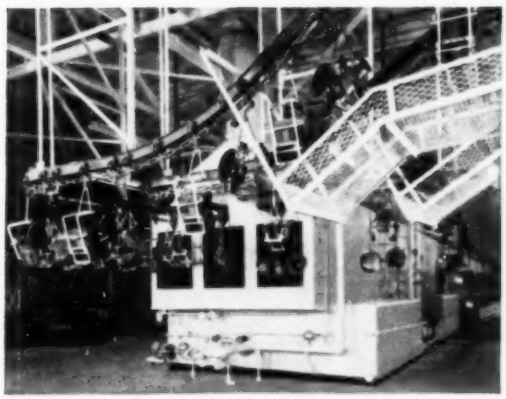
EAST	Hartford 7	O C Stevens Mchy Co
	Long Island City 1	Triplex Mach Tool Co
	Philadelphia 6	John S Wright Mchy
	Syracuse 1, Buffalo 23, Rochester 4, Schenectady	Syracuse Supply Co
MIDWEST	Cincinnati 2	E A Kinsey Co
	Chicago 51, Milwaukee 8	Four States Mchy Co
	Cleveland 3, Toledo 13	Golden & McCoy
	Dayton 2	C H Gosiger Mchy Co
	Detroit 19	Birmingham & Conner Mchy
	Grand Rapids 4	Joseph Monahan Co
	Indianapolis 20	C C Garrett Mchy
	Pittsburgh 37	Merit Mchy Co
	St. Louis 24, Kansas City, Mo., Wichita, Tulsa	Robert R Stephens Mchy Co
SOUTH	Atlanta 6	J R Waltraven
	Charlotte 5	Geo A Marshall Mchy
WEST	Houston 13	Wessendorf Nelms & Co
	Denver 16	Mine & Smelter Supply Co
	Los Angeles 22, Berkeley 10, San Diego 3, San Jose, Scottsdale, Ariz.	Moore Mchy
	Spokane 8	W R Matthews Mchy & Tool Co
CANADA	Toronto 8	Barker Industrial Equip Ltd

Processing EQUIPMENT...



Mahon Dehydrating Oven with Controlled Dew Point Installed on the Roof of the Copeland Plant, Sidney, Ohio.

COMPRESSORS are Dehydrated, Sealed, Inspected, Tested, Painted, and Charged with Refrigerant on ONE CONTINUOUS CONVEYOR PRODUCTION LINE!



Mahon Three Conveyor Line Two-Stage Metal Parts Cleaning Machine—Another Unit of the Compressor Processing Equipment Installed at Copeland Refrigeration Corporation, Sidney, Ohio.

The High Temperature, Low Dew Point Dehydrating Oven illustrated above is part of the modern straight-line production facilities for processing Compressors in the Copeland Refrigeration Corporation's plant, Sidney, Ohio.

When you need Processing Equipment or Special Production Equipment of any kind, you, too, will want to discuss methods, equipment requirements and possible production layouts with Mahon engineers . . . you'll find them better qualified to advise you, and better qualified to do the initial planning and engineering of equipment that will produce the desired end result at minimum cost per unit processed.

THE R. C. MAHON COMPANY • Detroit 34, Michigan

Sales-Engineering Offices in Detroit, New York and Chicago

Engineers and Manufacturers of Complete Conveyorized Finishing Systems: Metal Parts Washers, Metal Cleaning and Rust Proofing Machines, Conveyorized Cleaning and Pickling Machines; Dry-Off Ovens, Spray Booths, Electrostatic Spray Enclosures, Flow Coaters, Dip Coaters, Finish Baking Ovens, and Paint Stripping Equipment; Core Ovens, Soldering Ovens, Dehydrating Ovens, Heat Treating and Quenching Equipment for Aluminum and Magnesium; Dust and Fume Control Installations, and Many Other Units of Special Plant and Production Processing Equipment.

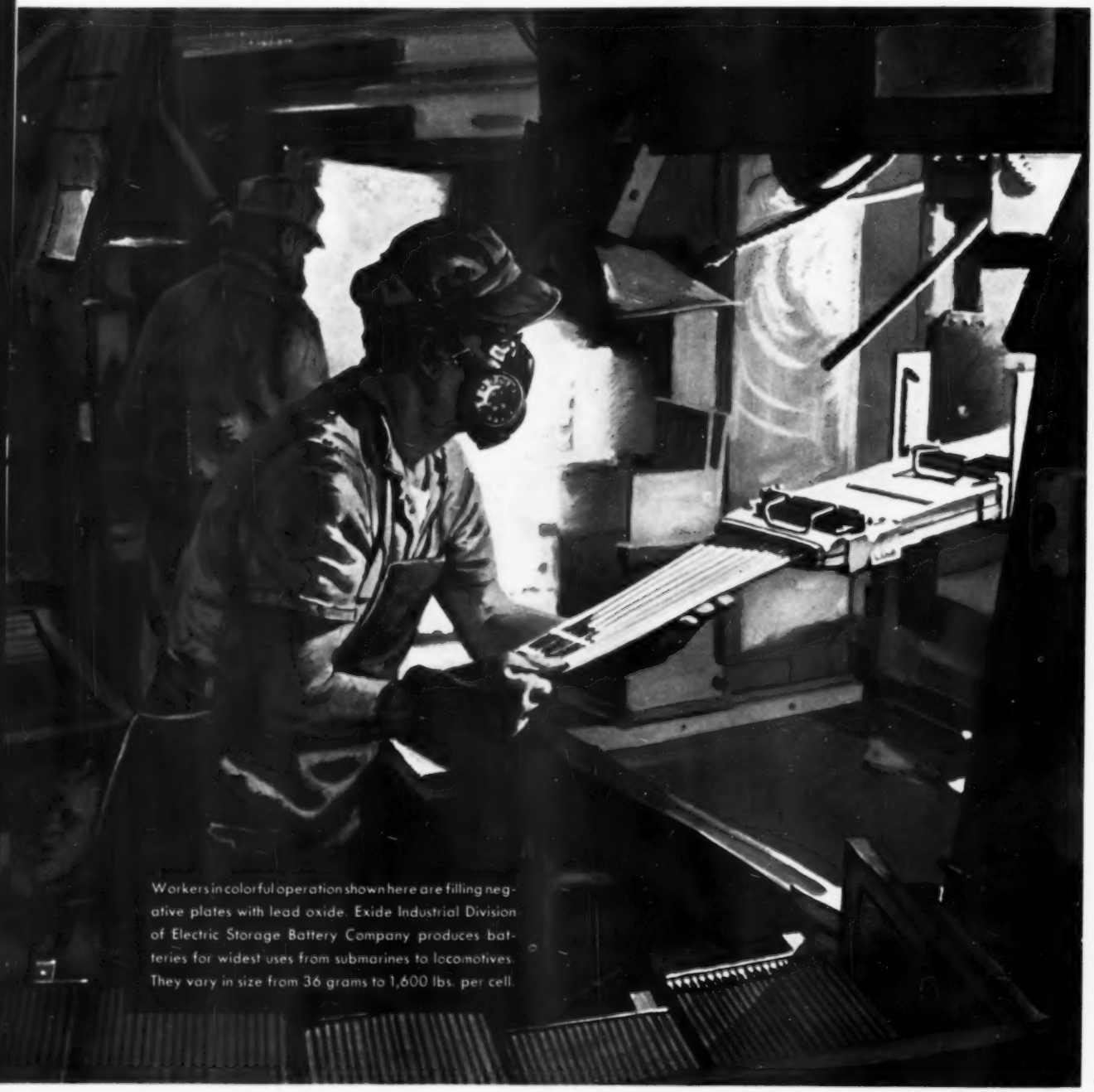
See Sweet's Plant Engineering File for Information and Representative Installations, or Write for Catalogue A-659

. . . the **EXPERIENCE** that goes into the **PLANNING** and **ENGINEERING** of **MAHON EQUIPMENT** is the item of **GREATEST VALUE** to **YOU!**

MAHON

Correct Lubrication in Action...

Mobil "sparks" $48,380



Workers in colorful operation shown here are filling negative plates with lead oxide. Exide Industrial Division of Electric Storage Battery Company produces batteries for widest uses from submarines to locomotives. They vary in size from 36 grams to 1,600 lbs. per cell.

Mobil

Complete Engineering Program
Proved Petroleum Products

Mobil

SOCONY MOBIL OIL CO., INC., and Affiliates: MAGNOLIA PETROLEUM CO., GENERAL PETROLEUM CORP., MOBIL OVERSEAS OIL CO., INC.

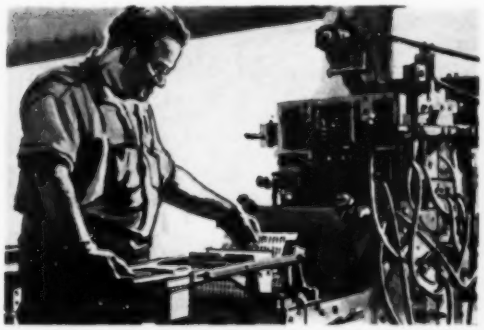
saving for Exide Battery

Here's how Exide Industrial Division of The Electric Storage Battery Company turned up new ways to cut maintenance costs, with the help of Mobil

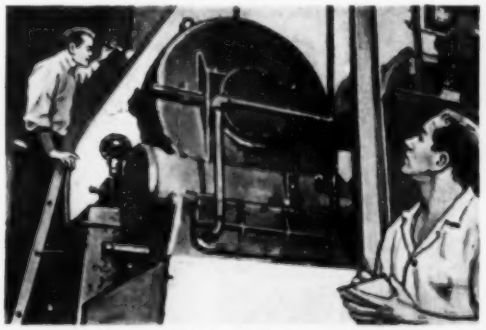
"*How can we make it better, or more efficiently?*" That's The Electric Storage Battery Company's challenging attitude. For five years now Socony Mobil has helped meet this challenge in the company's Philadelphia plant. During this period Mobil's lubrication program has saved $48,380 in maintenance costs.

Mobil's Correct Lubrication program helped put the plant's lubrication on a sound engineering basis. Every machine's needs were charted . . . rigid maintenance schedules established. Even the oilermen's routes were revised to improve efficiency. As a result, 1,256 maintenance man-hours a year are now available for other purposes. Other sizable savings are listed below.

This is *Correct Lubrication in Action.* Lubrication specialists who work closely with plant supervisors. In-plant lubrication training for maintenance personnel. Research and laboratory facilities. These services and many more are all backed by Mobil's 93 years of lubrication experience. It's helped Exide Industrial Division produce top quality batteries for less cost. It can help you cut costs, too.

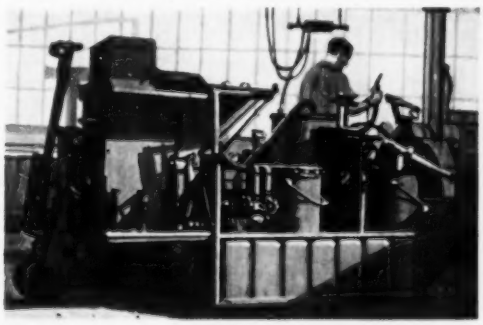


Repair of roller drive chains interrupted schedules of Grid Casting Units at five-month intervals. Mobil recommended installation of 4 gravity feed oilers with lubrication brushes that cut downtime, maintenance time, too. Saving—$8,003.



Inspection revealed abnormal wear of bull gear on grinding-mill and need for major overhaul and replacement. Mobil recommended grinding teeth, resetting gear and use of heavy, high-film strength gear oil. Gear replacement avoided—$10,000 saved.

Plate Filling Machines were being greased by hand at thirty-minute intervals. Mobil recommended automatic grease system with water-resistant Mobil product. This saved 25 man-hours per week . . . cut bearing wear rate 25% . . . has already saved $15,300.



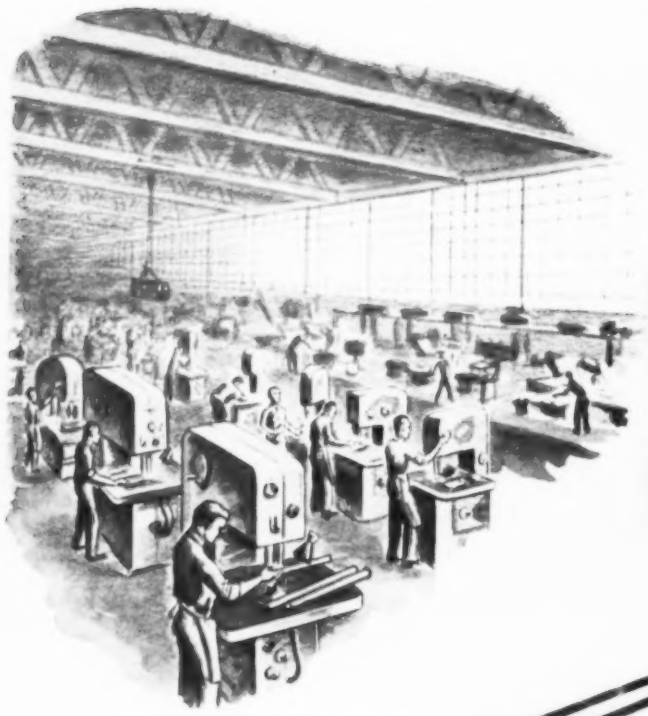
Modern lubricating equipment, efficient routing and charts prepared for every machine in Exide's plant by Mobil engineers reduced lubrication application time 68%. Types of lubricants were cut from 25 to 10, simplifying storage and inventory.

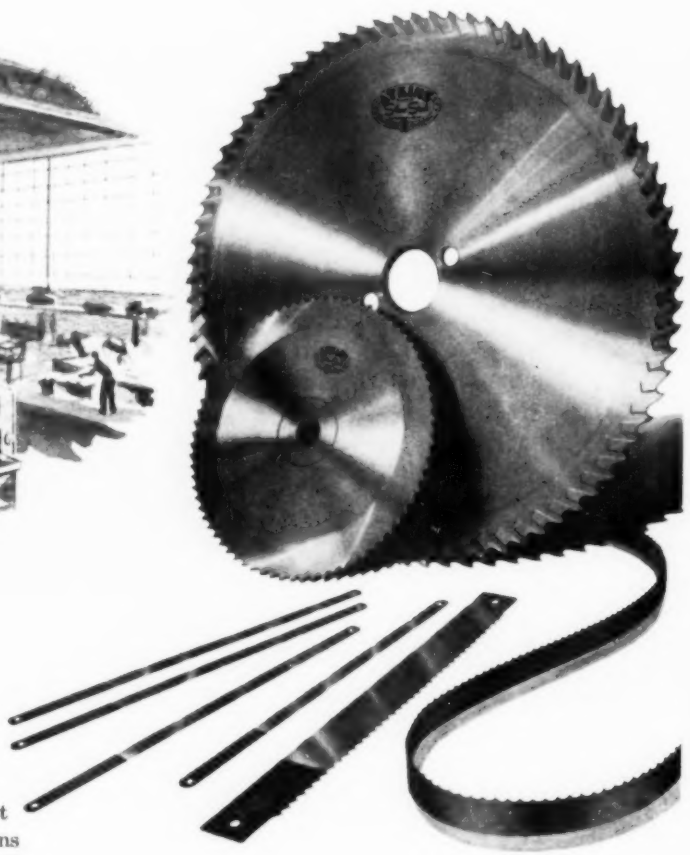
Correct Lubrication

Another reason You're Miles Ahead with Mobil!

Give a man a tool he can trust

—and watch production costs go down!





A workman's skill and time on the job will be more productive when he works with tools he can depend on. A fine saw, for example . . . in expert hands or on a good machine . . . means a better product finish, less waste, fewer delays. It instills pride of workmanship and turns out *more profitable* work. That's why, throughout the metal-working industry, the best workmen are equipped for their best work with *guaranteed* . . .

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of Service to American Industry

Atkins Saws

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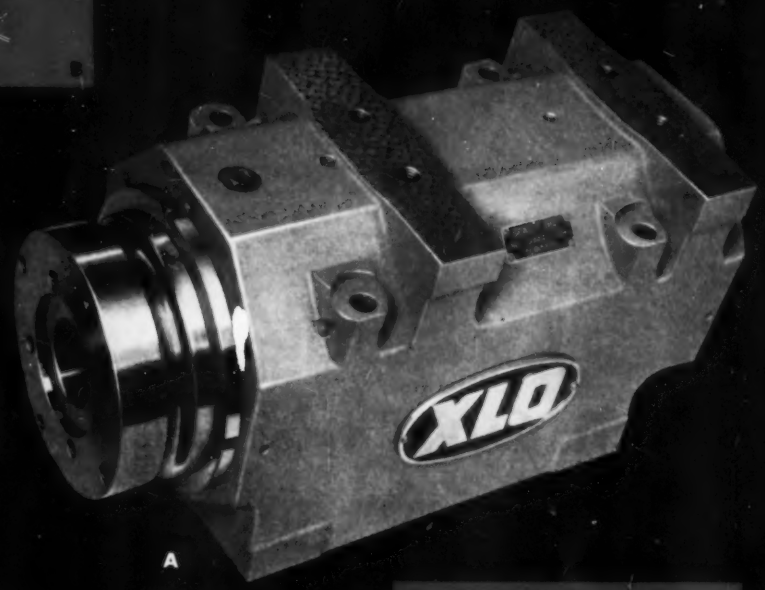
XLO EX-CELL-O FOR PRECISION

C



A

D

A. Standard DB 24 Spindle
B. DB 50 Motorized Spindle
C. DB 25 Square Body Spindle
D. DB 50 Motorized Quill-Type Spindle
E. DB 22 Square Body Spindle
F. Standard DB 22 Spindle

E

57-90

Greater Accuracy—with Ex-Cell-O Precision Boring Spindles

No one need tell you of the proven superiority of Ex-Cell-O precision boring spindles where close tolerances and fine finishes are required. But, did you know that these same Ex-Cell-O boring spindles have been used as replacement units for years?

Produced in belt-driven, standard motorized, or high frequency motorized styles, these Ex-Cell-O precision spindles are equipped with XLO Precision bearings for maximum spindle rigidity, long life and smooth operation. Permanent bearing lubrication reduces maintenance costs, prolongs bearing life.

For complete information, why not get in touch with your local Ex-Cell-O representative or, if you prefer, send direct for bulletin 25477.

EX-CELL-O CORPORATION
DETROIT 32, MICHIGAN
Machinery Division

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING AND BORING SPINDLES
CUTTING TOOLS • TORQUE ACTUATORS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS
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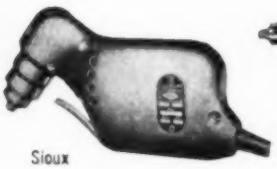
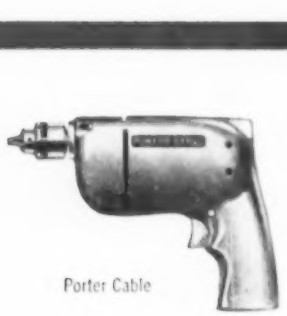
Master Pneumatic



Sioux

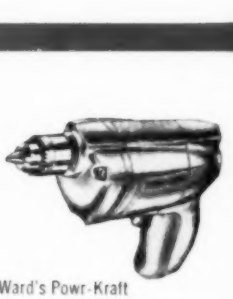
Millers Falls



Porter Cable

Sunbeam

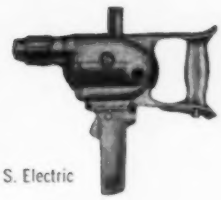
McGraw-Edison



Ward's Powr-Kraft

Black & Decker

Gibraltar



U. S. Electric

Ingersoll Rand

Stanley

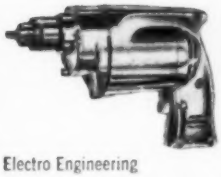
Jacobs CHUCKS

Thor

Rotor

Thor-Speedway

Dormeyer



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Your industrial supply distributor makes it his business to know your business. He is always available and ready to fill your needs quickly, dependably and economically. When you need chucks, you can depend upon Jacobs and the Jacobs industrial supply distributor who works with you . . . your partner in progress through service.

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THE JACOBS MANUFACTURING COMPANY, WEST HARTFORD, CONNECTICUT

World's largest, most complete line of permanent and electro-magnetic and vacuum chucks

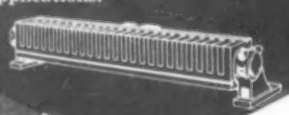
Walker Chucks are designed and engineered to give efficient and completely dependable performance in all applications. The incomparable combination of structural and operating features makes Walker Chucks your best buy in every way.

Walker permanent magnetic chucks utilize ceramic magnets which have *three times* the coercive force of alloy magnets. Rectangular chucks are available in 6 stock sizes, 6 x 10" to 12 x 24"; rotary, from 4" to 60" dia.

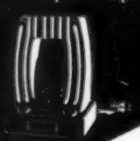
Small, thin work is easily handled with Walker bar pole electro-magnetic chucks. Rectangular in 81 sizes, from 6 x 12" to 30 x 96".

Holding jigs and fixtures are eliminated when you use Walker electro-magnetic chucks. Rectangular in 72 stock sizes, from 4 x 8" to 30 x 96"; rotary, from 6" to 36" dia.

In addition to the extensive range of stock sizes of permanent, electro-magnetic, and vacuum chucks and holding fixtures, Walker is your best source for "specials" for specific applications.



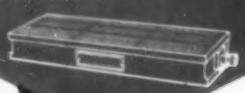
Walker has long been the leader in the field of demagnetizers. Stationary, hollow core demagnetizers are made to order in any size and shape of gap from 1" square up.



For complete information on the entire Walker line, write for Catalog No. 58.

O. S. WALKER COMPANY, INC.
WORCESTER 6, MASSACHUSETTS, U. S. A.

Walker vacuum chucks for holding non-ferrous parts are made to order in any desired size and shape. Favorites in the aircraft industry, they solve the problem of holding non-ferrous sheet stock. From 4" dia. to 10 ft. x 24 ft.



O. S. Walker

O. S. Walker—The Original Designers and Builders of Magnetic Chucks!

ACCO for Better Values

SPEEDY SLING SERVICE with ENGINEERED SAFETY!

ACCOLOY® KUPLEX SLING CHAINS

Quick Service from Distributor's Stock!

• Your nearby ACCO Authorized Sling Chain Distributor now offers a new sling service that saves time and money for you. This is made possible by American Chain's sensational, newly-designed **ACCOLOY KUPLEX Sling Chains.**

SAFE, STRONG, STREAMLINED

These slings are the *latest and greatest development* in sling chains. All parts in each leg are manufactured *exclusively* by American Chain, of the same alloy, and engineered to be as strong as the chain itself. They are of a streamlined design that reduces the possibility of catching or snagging.

Finally the component parts are factory proof-tested to twice the working load limits—your assurance of maximum strength and safety.

Another valuable feature: all parts remain visible for easy, periodic wear inspection.

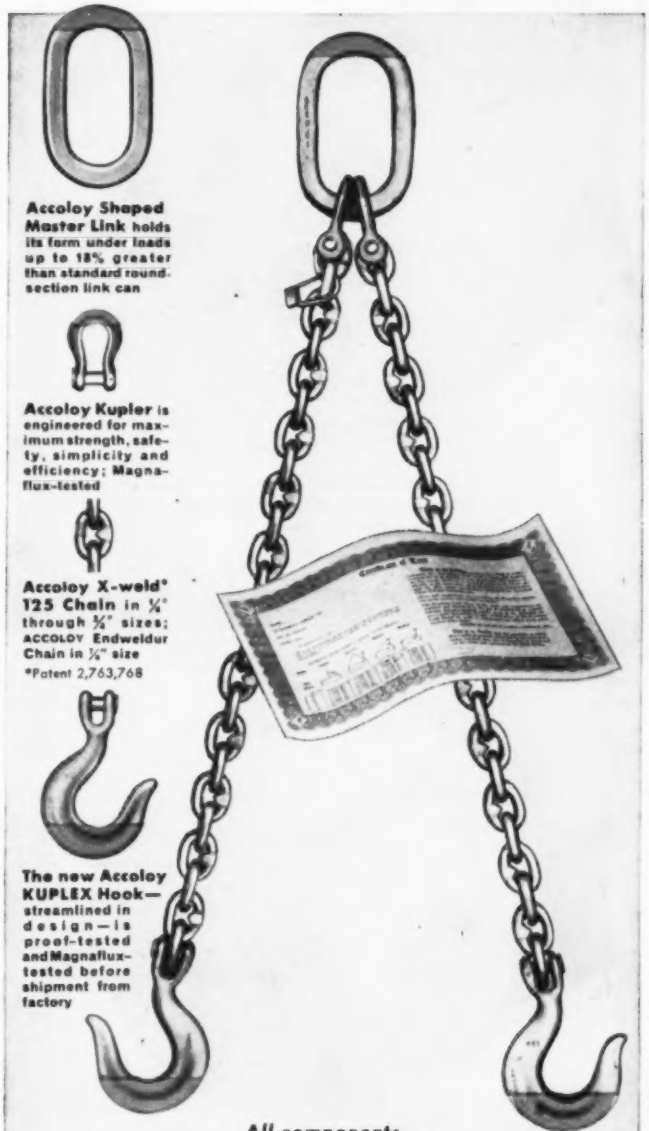
TWO STYLES—SIX SIZES

The new ACCOLOY KUPLEX Sling Chains are available in single-leg and two-leg styles and in six chain sizes, from ¼" through ⅞". All chain is made of Accoloy 125 material. All component parts of each assembly are marked and easily identified as to the size of chain with which they are to be used. Components are *color-marked in* orange for easy identification.

CERTIFICATE OF TEST, issued by ACCO and signed by your Authorized Distributor, is furnished with each sling shipment.

GET THE COMPLETE STORY

You will find it to your advantage to get the full story of ACCOLOY KUPEX Sling Chains. Learn how promptly they can be serviced . . . how easily repairs or parts replacements can be made, should they ever become necessary . . . and how you can benefit from this Great New Distributor Service and this Great New Sling Chain. Write for **Folder DH-39** and name of nearest ACCO Authorized Sling Chain Distributor.



Accoloy Shaped Master Link holds its form under loads up to 18% greater than standard round-section link can

Accoloy Kuplex is engineered for maximum strength, safety, simplicity and efficiency; Magnaflux-tested

Accoloy X-weld* 125 Chain in ¼" through ⅝" sizes; ACCOLOY Endweldur Chain in ⅞" size

*Patent 2,763,768

The new Accoloy KUPLEX Hook—streamlined in design—is proof-tested and Magnaflux-tested before shipment from factory

All components
PROOF-TESTED and COLOR-MARKED for easy identification

American Chain Division
AMERICAN CHAIN & CABLE
Bridgeport, Conn. • Factories: *York and *Braddock, Pa.

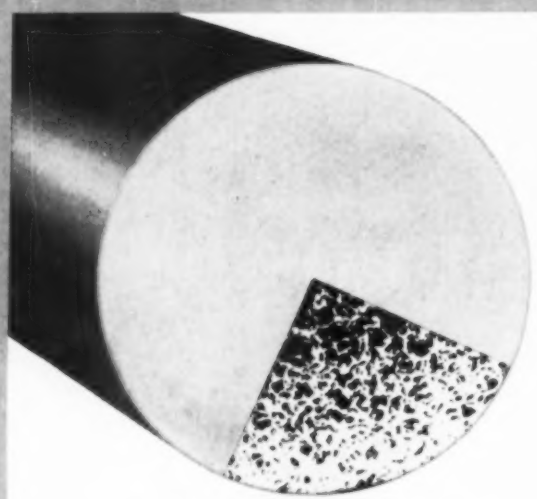
ACCO

Sales Offices: *Atlanta, Boston, *Chicago, *Denver, Detroit, *Houston, *Los Angeles, New York, Philadelphia, Pittsburgh, *Portland, Ore., *San Francisco

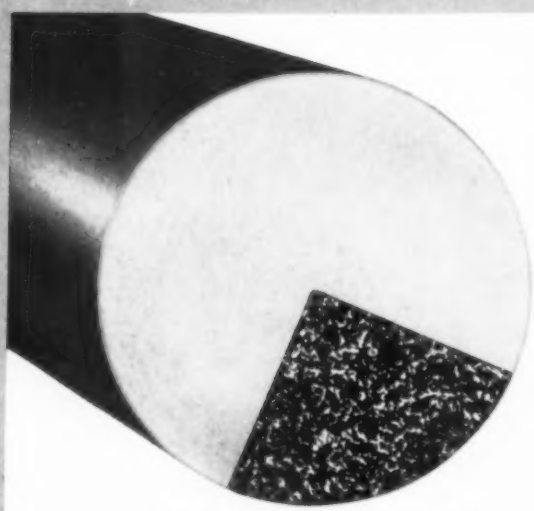
*Indicates Warehouse Stocks

Republic Cold Drawn Carbon Corrected Bars

REDUCE YOUR COSTS 3 WAYS!



Photomicrograph showing decarb to a depth of .020" in the surface of hot rolled bar of C-1050 steel—magnified 100 times.



Here is the same bar after carbon correction annealing. Note the restoration of carbon on the outer surface, also the refinement of grain structure.

1. You save both metal and money by eliminating waste. Republic Carbon Corrected Bars eliminate the extra preparation of machining or grinding away the surface of the bars to remove decarb.

2. You eliminate the need for buying bars oversize to allow for decarb removal to depths of 20 thousandths of an inch or more.

3. You get better MACHINABILITY.

Carbon correction is the restoration of all the carbon lost from the bar surface through decarburization during hot rolling. The lost carbon is restored right out to the surface of the bar by annealing in a controlled carbon-rich atmosphere prior to cold drawing.

Another advantage of this process is the resulting refinement of grain structure as indicated in the photomicrographs.

Carbon Corrected Bars are ideally suited for your steel parts calling for high surface hardness—particularly those produced by high frequency induction heating.

To the advantages of carbon correction add the improved machinability produced by the cold drawing process. You can eliminate finishing operations by taking advantage of the full diameter of Republic Cold Finished Steel Bars. You can boost feeds and speeds with no sacrifice of tool life or finished surface quality. You can secure better product performance through the higher ultimate strength, yield point, and hardness of cold drawn steel.

Republic metallurgists and machining specialists are available to help you use Republic Cold Drawn Carbon Corrected Bars to best advantage. They are ready to help you raise production efficiency, lower unit cost, obtain better machinability. No obligation. Just mail the coupon.

REASONABLE COST, GREAT STRENGTH, AND PRECISE TOLERANCE are requirements met by Republic Cold Finished Alloy Steel Bars in the production of sucker rod couplings. The parts must also withstand enormous static and dynamic loads, to more than 40,000 psi. Alloy steels provide an outstanding combination of qualities essential to designing smaller sections to carry heavier loads safely. By adding the advantages of the cold finishing process, you have a material that offers strength, hardness, machinability, size, and cross-sectional accuracy, smooth bright surface, and close tolerance straightness. Send coupon for more information.

REDUCE COSTS, IMPROVE QUALITY, INCREASE PRODUCTION with Republic Cold Drawn Special Sections. Formed to the predominating cross-section of the part to be produced, special sections eliminate or greatly reduce required machining. Results are faster output and lower cost. Also, since cold drawing improves the physical properties of any given analysis, completed parts are stronger and longer wearing. Other advantages may include improved performance and simplified design. Send coupon for full facts.

MACHINABILITY, SUPERIOR STRENGTH, AND CORROSION-RESISTANCE are reasons for the use of Republic Cold Finished Stainless Steel Bars in parts such as outboard motor drive and propeller shafts. Republic's cold finished, free-machining stainless steel bars offer close tolerance, accuracy of section, uniform soundness, and fine surface finish. Two grades, A.I.S.I. Types 416 and 430-F are fully 90% as machinable as Bessemer screw stock. Republic also supplies ENDURO® Stainless Steel in hot rolled bars, special sections, and wire. For more facts, mail the coupon.

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Please send more information on:

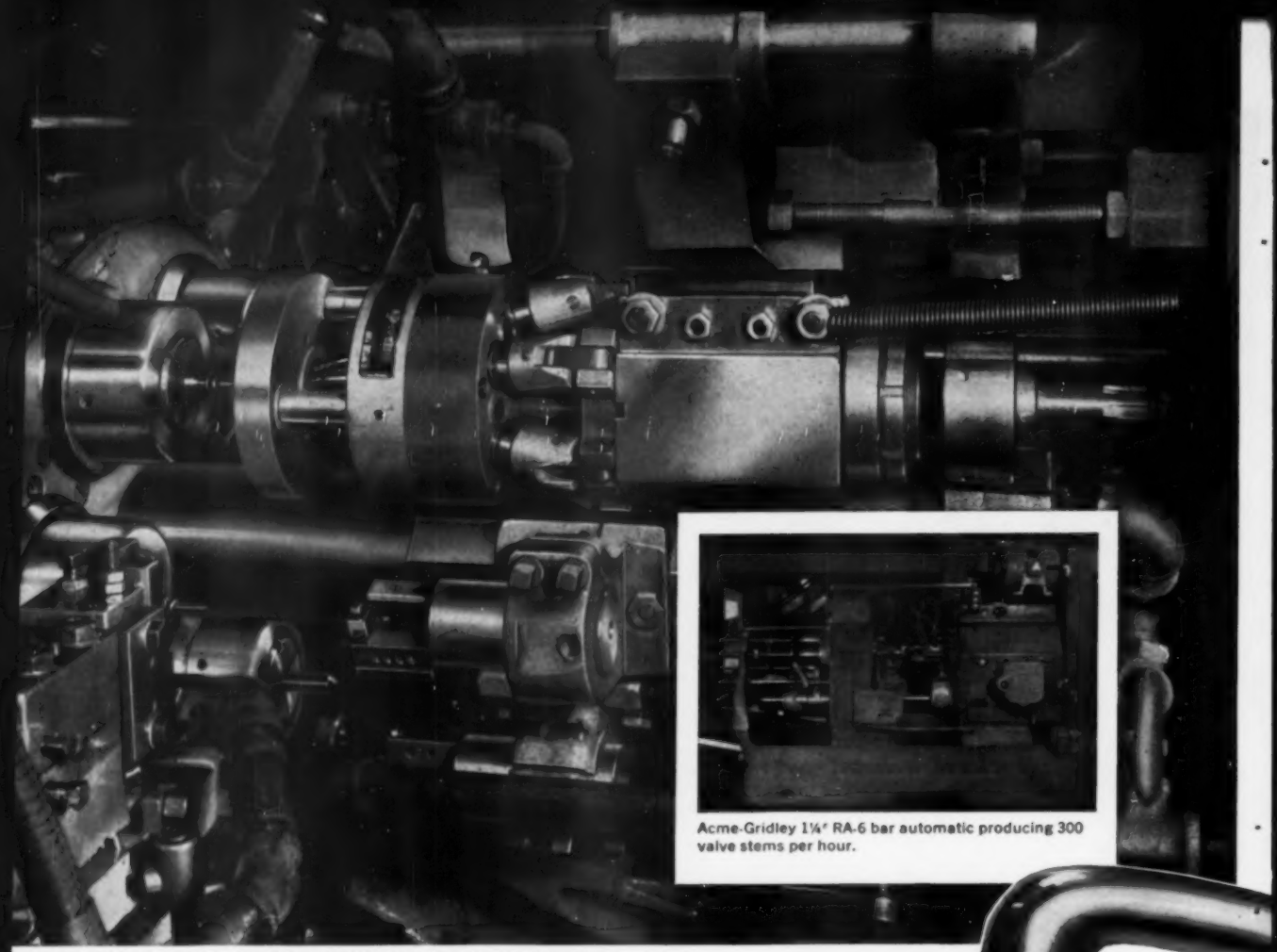
☐ Carbon Corrected Bars
☐ Special Sections
☐ Cold Finished Alloy Steel Bars
☐ Cold Finished Stainless Steel Bars

Name_____ Title_____

Company_____

Address_____

City_____ Zone____ State_____



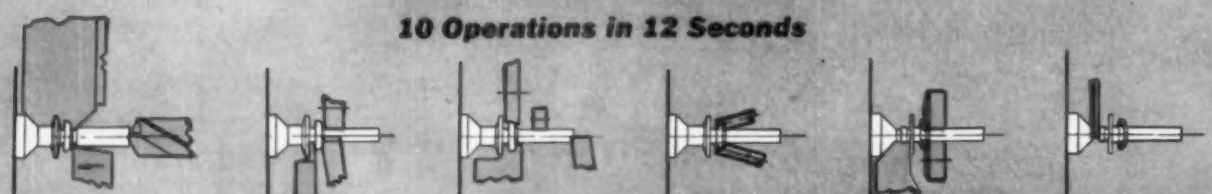
Special Namco-designed multiple end milling attachment in the 3rd position.

Acme-Gridley 1¼" RA-6 bar automatic producing 300 valve stems per hour.

When Tolerances and Finish Looked Economically Impossible

AMERICAN-STANDARD TURNS TO ACME-GRIDLEY...

10 Operations in 12 Seconds



6th position Rough form rear —rough turn stem —spot drill

1st position Finish turn stem face large diameter

2nd position Shave—face and chamfer stem end

3rd position Stop spindle— mill six slots

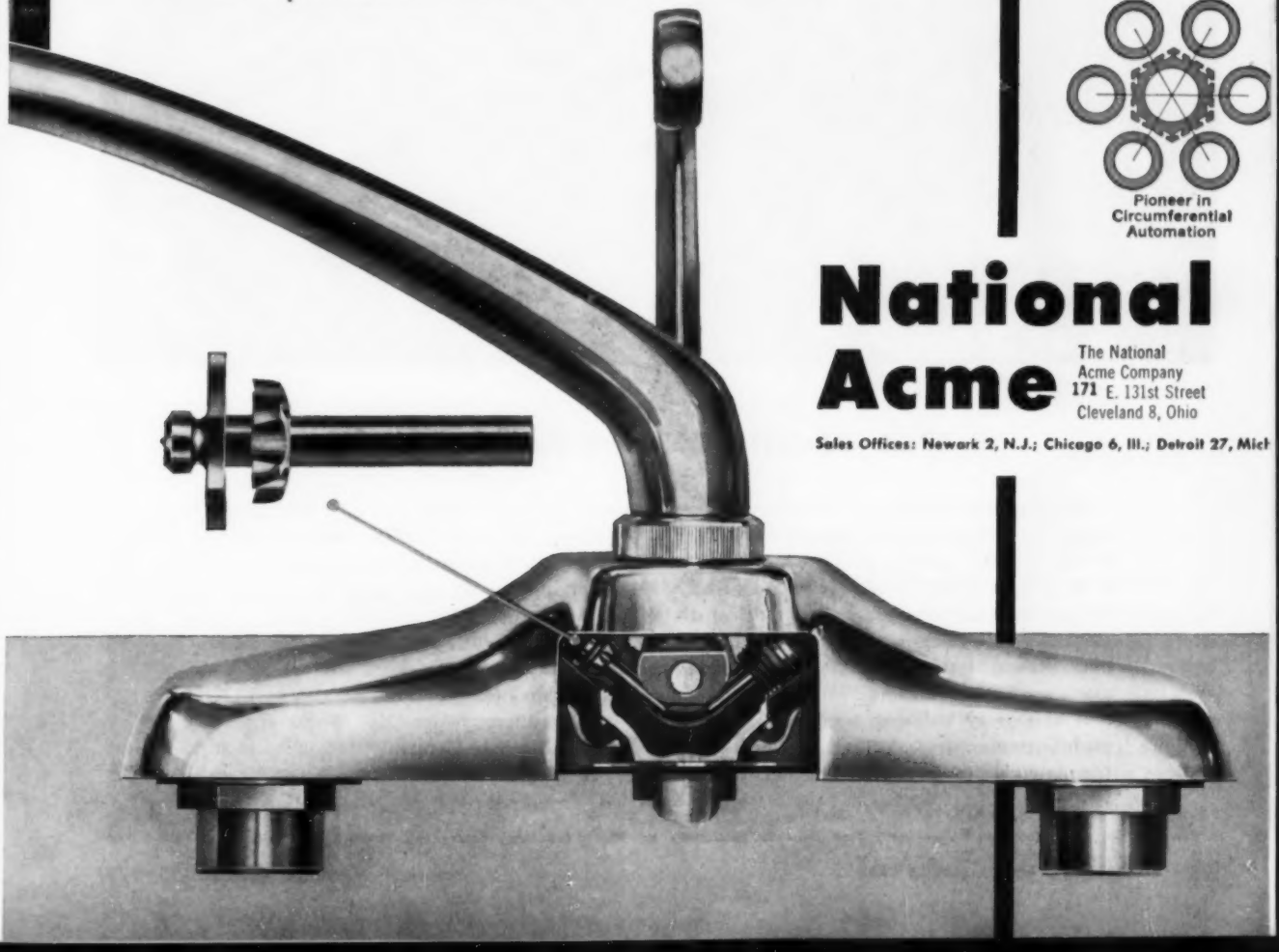
4th position Start spindle— burnish stem— form back end

5th position Cutoff

COMPLETED IN A SINGLE SETUP . . . this hyseal valve stem is a vital component in American-Standard's single-lever mixing faucet. Production by other processes would have meant a two-piece assembly. It would have been economically impossible to meet the high standard of quality and exacting tolerances maintained on this company's products.

Ten operations, including multiple end milling of six half-holes on a 15° angle, were performed on this 303 stainless steel piece in 12 seconds. Rigid specifications required a 20 microinch finish and limits of .002 t.i.r. between seating surface and end of valve stem.

Advanced spindle stopping design and the inherently accurate indexing of Acme-Gridleys, assure proper alignment of the work with the standard and special tool attachments. This, together with wide open tooling zones and independently operated tool slides, helps assure the solution of "impossible" jobs at National Acme. Write or ask one of our representatives for the complete story on the industry's most modern approach to your cost reduction problems.



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JONES & LAMSON MACHINE TOOLS

the man who needs
a new machine tool is
already paying for it

Out-of-this-World Accuracy

Whether they're destined to go "out of this world" or not, many jobs demand some "out of this world" machining. Here's one, on a J & L lathe which is adapted for two-way tracing from the hexagon turret. Critical dimensions on both internal and external tapers, plus several intricate contours are finish-machined in one chucking.

A three-way indexing template holder is push-button controlled. Thus, down-time for template changes is eliminated, and the 180° tracer continues to machine on both the forward and return feed of the saddle carriage.

A single selector switch disengages the tracing unit and the machine is ready for normal* turret lathe operations.

*("Normal" for J & L turret lathes means unsurpassed accuracy, high production, and low, low maintenance.) For details, write for our descriptive folder No. 5440. Jones & Lamson Machine Company, 502 Clinton St., Springfield, Vermont.

Turret Lathes • Automatic Lathes • Tape Controlled Machines • Thread & Form Grinders • Optical Comparators • Thread Tools

CIMCOOL PRESENTS . . .

CIMPERIAL

Here is what we believe to be the most advanced, the most effective cutting fluid in the history of the industry.

CIMPERIAL is an entirely *new* chemical concentrate *especially designed for heavy duty applications*. It is the only water-miscible fluid capable of performing the tough, low clearance, low speed operations previously limited to cutting oils.

CIMPERIAL is a *chemical solution*—not an emulsion—which effectively covers 95% of all metal cutting jobs.

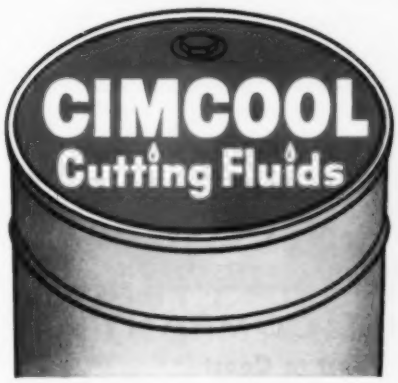
CIMPERIAL increases tool life because it defeats both heat and pressure. Forming a chemical solution in water, CIMPERIAL rapidly dissipates heat. Won't "hold" the heat as an oil will. CIMPERIAL contains newly discovered EP (Extreme Pressure) additives which give you more cutting action with less force. Result: *production equal to, or better than, oil; and working conditions vastly improved.*

Note these important advantages:

CIMPERIAL lasts longer. It won't turn rancid: it contains no food for bacteria and has a remarkable bactericide to control those bacteria that do enter the mix from outside sources. No more Monday morning odor. Less frequent coolant changes mean lower costs, less down time for machines.

CIMPERIAL is productive and clean. The *new* EP chemicals reduce the cutting forces and friction on the tool: in one case CIMPERIAL has already increased tool life 70%. It also has high film strength for lubricity characteristics better than oil. And there is no smoke or vapor around your machines.

CIMPERIAL controls rust. You get *two* types of chemical rust inhibitors in CIMPERIAL . . . which form both *polar* and *passivating* films over metal surfaces. This gives you, even at lean dilutions, double protection against corrosion.



FOR 100% OF ALL METAL CUTTING JOBS

Production-proved products of The Cincinnati Milling Machine Co.

CIMPERIAL—*newest* in the famous, industry-proven line of CIMCOOL® Cutting Fluids!
CIMCOOL S2 Concentrate—The pink fluid which covers 85% of all metal cutting jobs.
CIMPLUS—The transparent grinding fluid which provides exceptional rust control.
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ALSO—CIMCOOL Tapping Compound—CIMCOOL Bactericide—CIMCOOL Machine Cleaner.

For full information on great new CIMPERIAL and the complete family of CIMCOOL Cutting Fluids, call your CIMCOOL Distributor today. Or contact Cincinnati Milling Products Division, Cincinnati 9, Ohio.

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When you see uniformity, remember . . .

With Card spiral pointed taps you get uniformity

Your production's consistent ...because Card taps are uniform

. . . And they're always readily available to meet your production schedules. To this end, Card Division maintains a network of warehouses across the country. Inter-connected by teletype, these strategically located supply centers give your Card Distributor fast, efficient service. He's always ready for your jobs. You get the exact type of Card tap you need . . . in any quantity . . . at any time. Your Card technical man has complete details on Card taps, dies, and gages. S. W. CARD DIVISION, Mansfield, Mass.

Card Warehouses: Atlanta, Chicago, Detroit, Fort Worth, Los Angeles, New York, San Francisco.

CARD Quality

CARD

DIVISION OF UNION TWIST DRILL COMPANY

— Serving you through the best distributors from Coast to Coast

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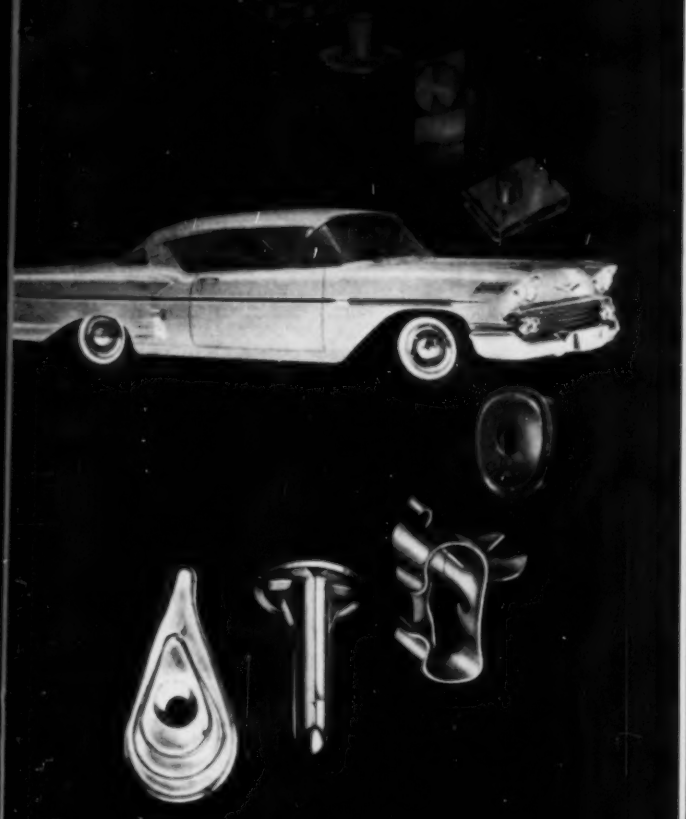
If you use carbide milling cutters as much as automobiles use fasteners . . .



Ordering Union carbide milling cutters will cut your production time and costs

The more you use carbide milling cutters the more you need Union

Union carbide milling cutters are typical of Union progress — in carbide tool development and in increasing the variety and versatility of milling cutter types. In plants throughout the country Union technical men have proved that the time and costs of many production operations can be reduced with Union carbide milling cutters and other Union carbide tools, as well as Union drills, end mills, reamers, hobs, inserted blade cutters, gear cutters and milling cutters.

Available nationally through Union Distributors and stocked in Union warehouses in Atlanta, Chicago, Detroit, Fort Worth, Los Angeles, New York City and San Francisco.

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Depreciation Reform—

Why Industry Needs A Modern Tax Policy

A shockingly large proportion of our industrial plant and equipment is obsolete. As indicated by an earlier editorial in this series, over $95 billion would have to be spent —and spent soon—to bring our industrial facilities up to the best modern standards. Yet plans for 1959 call for little more than $30 billion of actual spending—barely enough to make a start on this backlog of modernization.

At the heart of the problem of obsolescence is a federal tax policy that discourages business from replacing inefficient facilities. It is the purpose of this editorial to spell out a tax reform Congress can make this year—with little cost in terms of tax revenue—that would go a long way toward removing the barrier to modernization of plant and equipment. This reform is a more realistic system of tax deductions for depreciation and obsolescence of productive facilities.

A Barrier to Modernization

Industry abounds with examples of old and obsolete facilities—despite large expenditures made in the past few years. Two-thirds of our metalworking equipment is over ten years old. Over half the capacity of our chemical process industries was installed before December 1950. Only a minor fraction of our railroad freight moves in new freight cars or the new push-button freight yards.

The tax law bears a large part of the responsibility for this lag in modernization because of its important influence on business investment in plant and equipment. For many years the tax law has permitted as a deduction from income "a reasonable allowance" for wear and tear and obsolescence of productive facilities. These annual deductions affect business investment in several ways.

- They are the way a company recovers its investment in plant and equipment.
- They determine in large measure, the amounts of money that are spent each year to replace and modernize facilities.
- Furthermore, the schedule for depreciation often determines **when** a specific machine or building is actually replaced.

The law requires that depreciation deductions be spread over the "useful life" of a building or machine. But the periods of useful life for tax purposes today still depend heavily upon tables drawn up by the Treasury almost 20 years ago. These tables reflect the replacement practices of depression years. Also, they were compiled at a time when the pace of technological progress in industry was much slower than it is now. **For nearly all types of equipment the indicated period of useful life is longer —sometimes much longer—than most experts consider realistic at today's rate of technological advance.**

The result of these outmoded depreciation schedules is that the recovery of investment is dragged out, and the replacement of obsolete equipment is delayed.

In The Right Direction

Congress should establish, by law, the right to use shorter depreciation periods on productive equipment. It should do so in a way that would free industry from obsolete concepts of the rate of technological change and would provide incentives to install new equipment and produce new products.

The tax reform act of 1954 made some progress in this direction—but not enough. It introduced new methods for calculating depreciation—the declining balance and the sum-of-the-years' digits—which enable a business to recover most of the investment in a new facility in the early years of its useful life. However, these new methods do not accomplish their desired purpose when the supposed "useful life" is still an unrealistically long period of years.

Industry is by no means free from blame for the failure to bring depreciation policy into line with the needs of a modern, growing economy. According to Joel Barlow, president of the Tax Institute, "management has largely ignored the Commissioner's invitation . . . to come into the Internal Revenue Service office and make a case for shorter depreciable lives by establishing technological obsolescence."

The failure of many companies to see their own interest in more realistic depreciation not only holds them back from modernizing their own facilities but also lends support to the Treasury in its continued adherence to an outdated policy.

A Suggestion For Reform

An excellent model for reform of the depreciation policy in our tax law is the system used successfully in Canada for a decade. In Canada, all productive equipment may be depreciated at relatively fast rates assigned to each of 14 broad categories. The Canadian system permits depreciation up to twice as fast as the antiquated tables of useful lives now followed in the U. S. It also gives the individual business far greater flexibility in determining depreciation schedules that fit its own needs and experience.

For example, in the category or "bracket" covering general machinery a taxpayer in Canada may depreciate up to 20% of the machine's value annually, on a declining balance basis. In the U. S. the fastest rate at which many types of machinery can be depreciated is only 10%. In other categories, from tools and dies to buildings and pipelines, the Canadian system also allows faster depreciation and provides greater incentive to invest in new facilities.

The cost of this reform in terms of lower tax revenue would be small—probably less than $500 million in the first year. And even this would merely be postponed, not permanently lost. Indeed, there is a very good prospect that tax revenue would not suffer at all. The increase in spending for new plant and equipment resulting from this tax reform would mean an increase in wages and profits—and therefore in taxes—in industries that produce machinery and other capital goods.

A realistic tax policy on depreciation would provide a badly needed incentive for industry to replace obsolete and inefficient facilities with up-to-date plants and equipment. It would step up our rate of technical advance and economic progress. And it would put U. S. industry in better shape to meet the growing competition from other countries that have grasped the advantages of fully modern technology.

This message was prepared by the McGraw-Hill Department of Economics as part of our company-wide effort to report on opportunities for modernization in industry. Permission is freely extended to newspapers, groups or individuals to quote or reprint all or part of the text.

Donald C. McGraw

PRESIDENT

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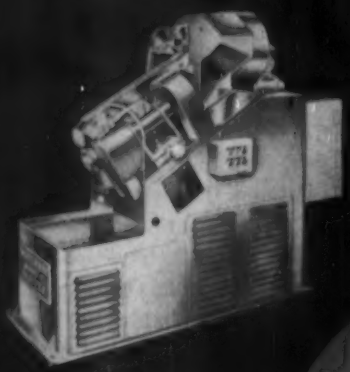
MACHINERY



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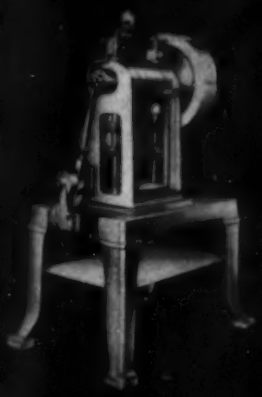

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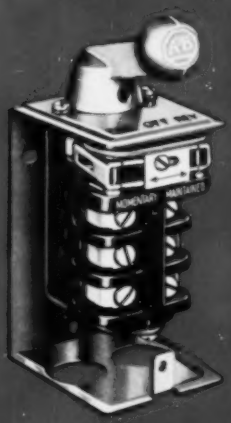
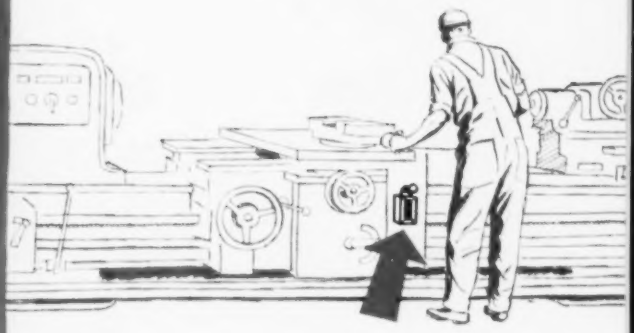
ALLEN-BRADLEY

REVERSING DRUM SWITCHES



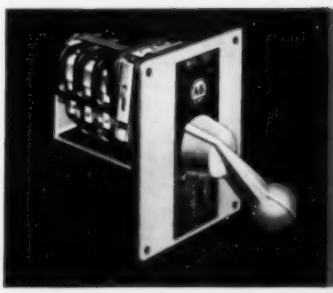
BULLETIN 350
Style A wrap-around cover is removed to show the readily accessible front wiring terminals. Max rating: 2 hp.



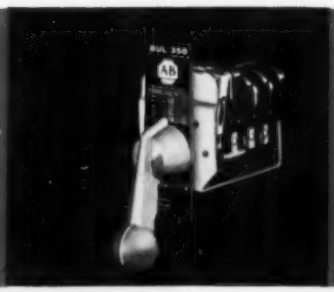
...styled to match the most modern production machines!

Inside and out—this Allen-Bradley drum switch is *all* new. Its trim, modern lines and attractive die-cast aluminum handle will give your production machines "up-to-the-minute" styling.

But there is more than beauty to this new switch. The rugged switch mechanism is a self-contained unit—independent of the enclosure. Misalignment and binding *cannot* occur. The base mounts directly on machine surfaces—without using spacers. And with the wrap-around cover removed, terminal screws are exposed for fast wiring—from the front. Changeover from momentary to maintained contact operation can be made in seconds. Investigate this new "leader" in its field. Send for Publication 6091.



OILTIGHT CAVITY MOUNTING
A-B Style AF reversing switches can be furnished with sealed shaft and rubber-gasketed, oiltight cover for cavity mounting in a machine base.



PANEL MOUNTING
The new Style A switches can be furnished for mounting directly on panels. Nameplate which gives ratings is also included with each switch.

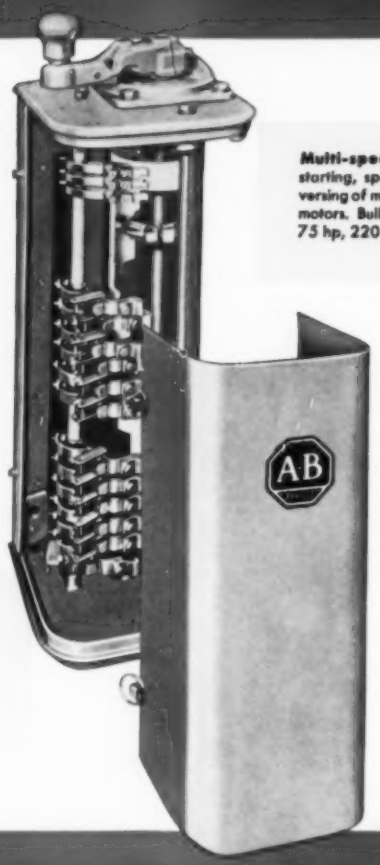
ALLEN-BRADLEY

Quality Motor Control

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.
In Canada: Allen-Bradley Canada Ltd., Galt, Ont.

3-59-MR

Reversing Drum Switch for across-the-line starting and reversing a-c and d-c motors. Interlocks available. Bulletin 350. Max ratings: A.C. 20 hp, 220v; 40 hp, 440-550v. D.C. 3 hp, 115-230v.



Speed Regulating Drum Switch for starting and regulating duty of wound-rotor motors. Bulletin 375 non-reversing. Max ratings: 500 hp, 220-440-550 v. Bulletin 385 reversing. Max ratings: 60 hp, 220 v; 75 hp, 440-550 v.

Multi-speed Drum Switch for starting, speed changing, and reversing of multi-speed squirrel cage motors. Bulletin 365. Max ratings: 75 hp, 220 v; 150 hp, 440-550 v.

A-B QUALITY

For years of dependable performance

ALLEN-BRADLEY DRUM SWITCHES

have no equal!

These Allen-Bradley drum switches provide simple and economical control for alternating current motors. Although low in cost, these unusually rugged switches are built under Allen-Bradley standards of *quality* . . . your assurance of reliable, trouble free performance. And this broad line of drum switches offers a variety of mounting types, operating handles, and interlocks to satisfy practically every requirement. Let us send you details on this versatile line of drum switches.

ALLEN-BRADLEY

Quality Motor Control

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.
In Canada: Allen-Bradley Canada Ltd., Galt, Ont.

3-59-MR

0A

9" column 3'-4' arms

1A

9"-11" column 3'-4'-5' arms

3A

13"-15"-17" column 4'-5'-6'-7' arms

4A

19" column 6'-7'-8' arms

5A

22"-26" column 7' to 12' arms

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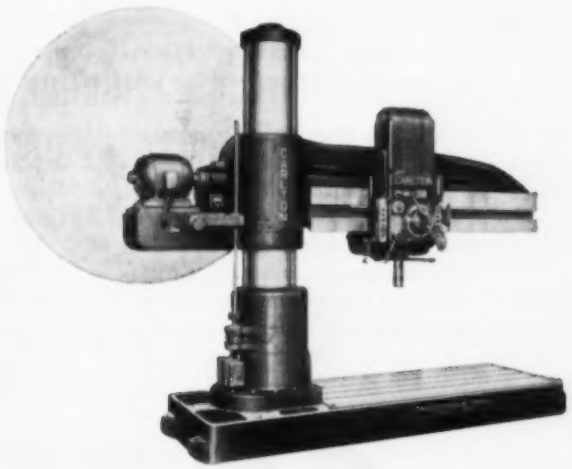
Carlton has specialized in radial drill research, engineering and manufacturing since 1916.
Our close contact with—and intimate knowledge of industry's drilling requirements—have produced a wide line of the most modern and up to date radial drills. Made in arm lengths from 3-ft. to 12-ft., column diameters from 9" to 26".
Programming, pre-select and manual speed-feed controls, plus special bases, tables, and jigs available for additional productivity. For further information, send today for free descriptive bulletins.
The Carlton Machine Tool Co., Cincinnati 25, Ohio.



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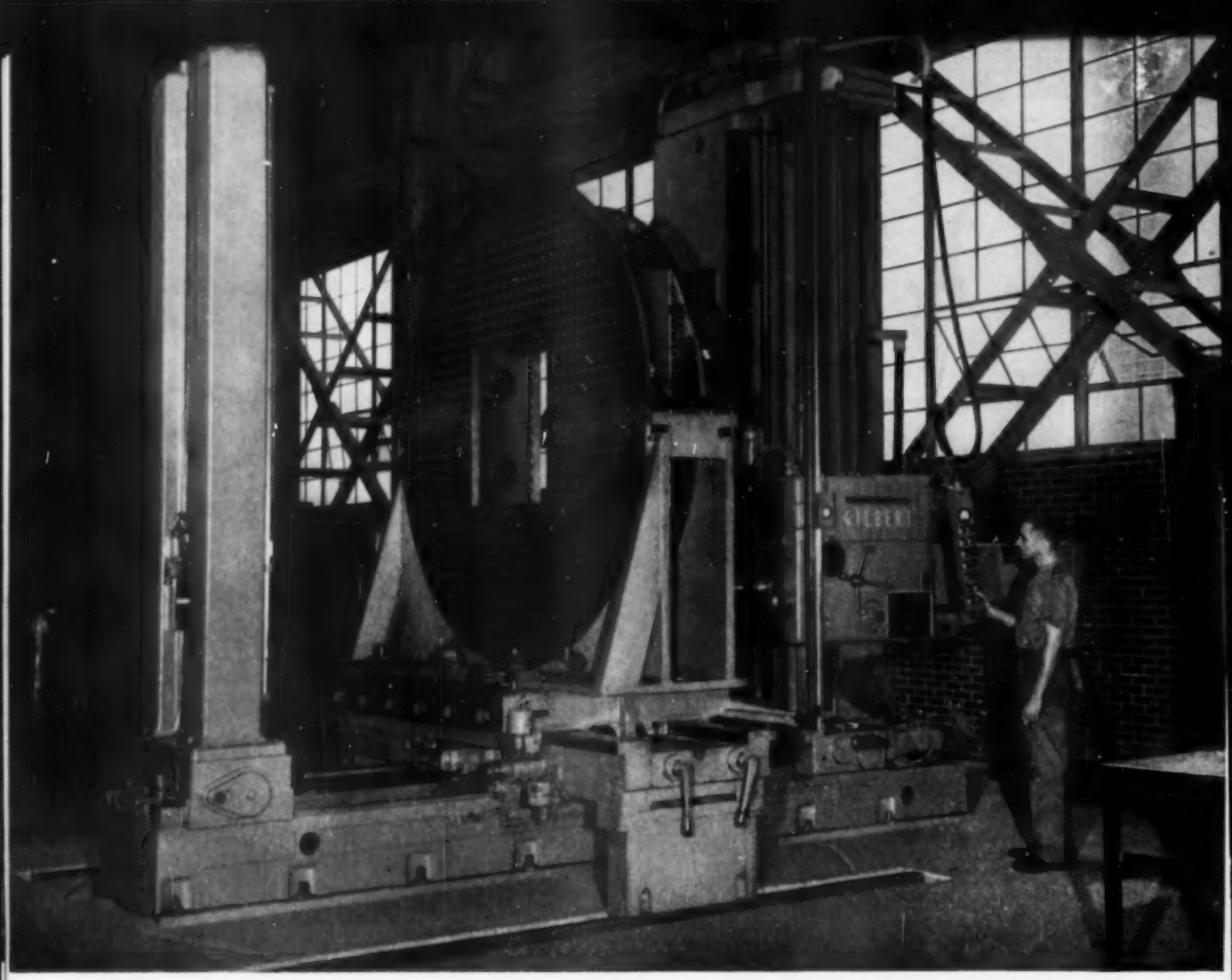
CIRCLE 253 READER SERVICE CARD



Courtesy Combustion Engineering, Inc.

Combustion Engineering uses Gilberts for precision boring on atomic reactors

It takes an unusual boring mill (specifically, a Cincinnati Gilbert) to meet the specifications on this job:

(a) diameters within .001",

(b) parallelism of center line of holes to center line of plate within .0001" per inch,

(c) parallelism of flat surfaces within .010",

(d) 32 R.M.S. surface finishes.

These are some of the machining requirements on this part for a fast breeder reactor built in the Chattanooga plant of Combustion Engineering, Inc., pioneer manufacturer in the nuclear field. They are typical of the quality of work assigned to this Cincinnati Gilbert table type horizontal boring mill. Automatic positioning makes work-handling fast and precise.

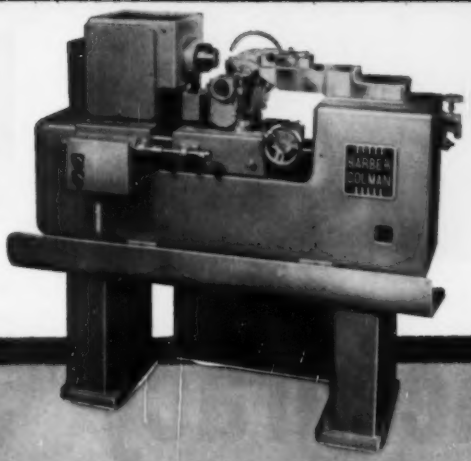
A number of other Gilbert boring mills are producing similar close-tolerance work for Combustion Engineering—proof that "those who buy Gilbert buy Gilbert again."

New Bulletin 1157 will show you why Gilbert boring mills do so many things so well.

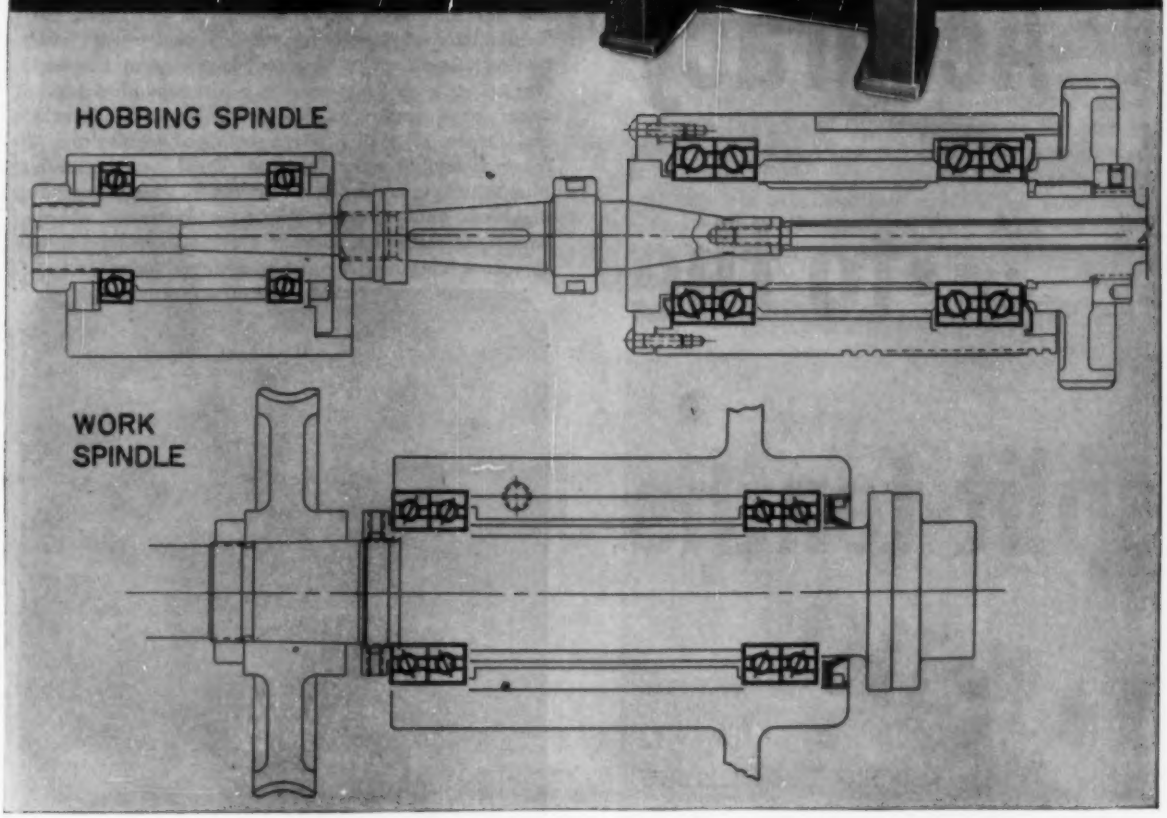
The Cincinnati Gilbert Machine Tool Co., 3340 Beekman Street, Cincinnati 23, Ohio.

those who buy **GILBERT** *buy Gilbert again*

CIRCLE 254 READER SERVICE CARD



Barber-Colman 2½-4 Hobbing Machine hobs precision instrument spur gears up to 2½" in diameter, 2¼" in length. Efficient design features vertical hob spindle adjustment; swivel hob mounting; antifriction way bearings, self-contained, recirculating oil lubrication.



Relative rotation of hobbing machine spindles held accurate within 20 seconds using Fafnir Ball Bearings

New Barber-Colman 2½-4 machine precision-hobs spur gears for instruments

If two words can sum up the design of Barber-Colman's new 2½-4 Hobbing Machine, they are *accuracy* and *rigidity*.

Developed for hobbing AGMA Precision Class 3 fine-pitch spur gears for guidance systems, the 2½-4 has a minimum number of parts at points where deflection or inaccuracies might occur.

In selecting bearings which would complement the accuracy of the gears in the machine, Barber-Colman designers got the performance they wanted with Fafnir super-precision ball bearings. Single row, extra-light, counter-bore types, eight used in duplex pairs, help maintain indexing accuracy within *20 seconds*.

The application is typical of thousands Fafnir has handled where performance requirements put an extra premium on bearing selection. Chances are, Fafnir experience — plus breadth of line — can answer bearing problems you may have. Write The Fafnir Bearing Company, New Britain, Connecticut.

FAFNIR
BALL BEARINGS

10 Fafnir Extra-Light Super-Precision Ball Bearings, snug fit, support the Barber-Colman 2½-4 machine spindles. 4 variations, equipped with composition retainers, are available in this one series to meet specific load and speed requirements where exceptional rigidity is wanted.

Announcing for the missile era:

3 new toolroom aces

Accuracy to the split-tenths

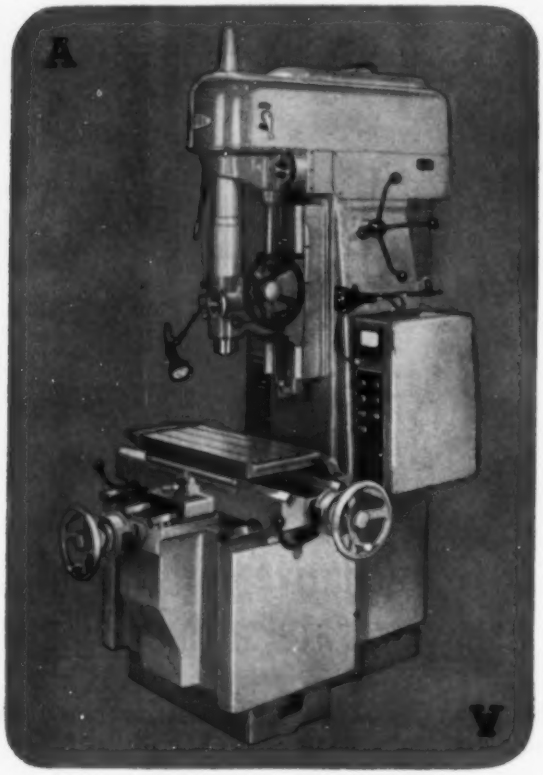
FLASH!

All Moore machines shipped after February 15, 1959 are made and calibrated to the New International Inch

LOCATES AND BORES HOLES TO LESS THAN A "TENTH"

No. 3 Moore Jig Borer

For boring, drilling, reaming and spotting holes in dies, jigs and production parts, the speed and accuracy of the Moore Jig Borer has never been equaled. Now, with this new and larger No. 3 model, you will break the "tenth" barrier! Here's why: it offers more precise positioning tolerances...all hardened, ground and lapped ways...no gibs...no overhang...improved drive... wider speed range, 60 to 2250 RPM...larger table working surface, 11" x 24"...micro setting of vernier dial... more accessible cross-clamping. These new features, plus sensitive, centralized controls for spindle speeds and feeds, quick tool-changing, easy lubrication add up to a Jig Borer which belongs in every toolroom where *tomorrow's* accuracies must be achieved *today!*



DETAILED LITERATURE ON EACH OF THESE MACHINES IS AVAILABLE ON REQUEST.

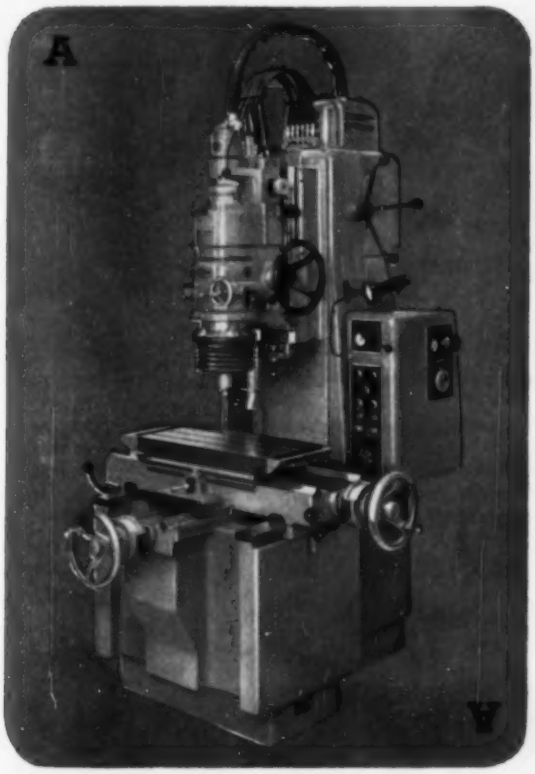
MOORE TOOLS BRIDGEPORT, CONN.

Manufactured by

LOCATES AND GRINDS HOLES TO LESS THAN A "TENTH"

No. 3 Moore Jig Grinder

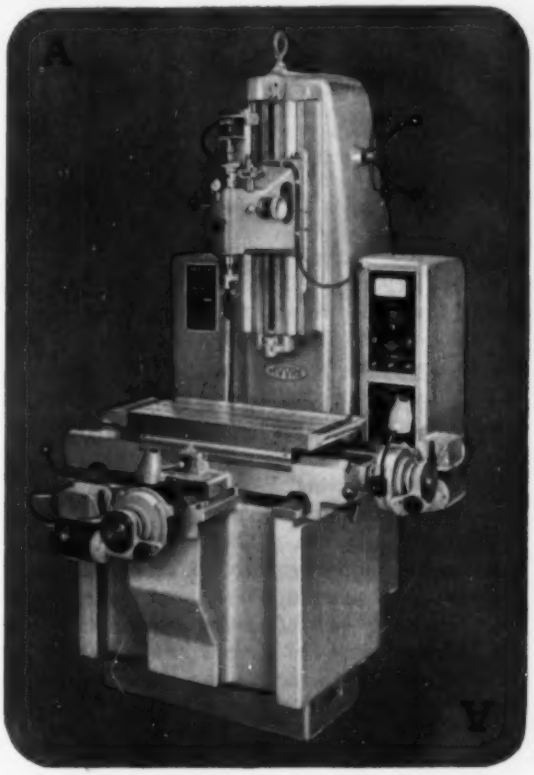
The originators of jig grinding and the Jig Grinder have done it again! Now, with this new, larger No. 3 model, you can grind—*with split-tenth accuracy*—holes plus regular and irregular contours to size and location after hardening. This is made possible by the closer locational tolerances built into the machine... by the all-hardened-ground-and-lapped ways... by the faster strokes provided for chop-grinding... by the infinite spindle speeds, 40 to 250 RPM... by the larger table working surface, 11" x 24". The same quickly set precision lead screws as in the Moore Jig Borer simplify the finish-grinding process.



MEASURES TO ONE-THIRD OF A "TENTH"

Moore Universal Measuring Machine

This machine, built on the same basic principles as the No. 3 Moore Jig Borer and No. 3 Moore Jig Grinder, introduces a new concept in ultra-precise measurement and inspection. It offers *for the first time:* A machine combining the capacity for larger work-pieces; choice of electronic indicator supported on an accurate, rotatable spindle, or a universal microscope for pickup; a combination of rectilinear and angular positioning, making possible the measurement of the most complex contours. Design and construction insure the highest possible accuracy. All ways are hardened, ground and lapped steel, fitted to hand-scraped cast iron. Table positioning in two directions of travel is by means of master lead screws. Note motorized lead screw drive, offered as optional equipment (available only for Measuring Machine).



MOORE SPECIAL TOOL COMPANY, INC., Bridgeport, Conn.

PRECISION BORING

with no rejects

hole location accurate to ±.0001"

hole sizes repeated to ±.0001"

SAVE 300 HOURS PER UNIT

on precision boring of gear boxes. Each unit (2 halves) calls for over 200 holes, averaging 4 operations per hole and 3 setups per unit. Boring, spot facing, recessing, milling, tapping and counter boring. Material is magnesium alloy. Location tolerances ±.0001.

Boring time reduced from 800 hours to 500 hours per unit—with no rejects in all 50 parts—and every one accurate to ±.0001" on hole size and location!

Mr. R. Schmidt of Triangle Tool Co., Union, N. J., owner of this Fosmatic Jig Borer, reports, "Two Fosmatic features were largely responsible for this important time saving. First, the Fosmatic's long table travel permitted machining two parts at once. Second, the automatic positioning and Direct Dimension Measuring System work simply and fast. They eliminate confusion and help the operator work accurately and efficiently. Incidentally, that long table travel helped get us several new jobs we could never have handled on our other jig borer."

With Direct Dimension Measuring the operator sets dimensions direct from blueprint onto two direct reading drum dials. At the press of a button, the table automatically positions work to ±.0001".

Fosmatic Jig Borers bring you many important advances in boring technology. Where progress has been so great, the obsolescence of your old machine may be more costly than you suspect. *Why not run a check?* Call your Fosdick Distributor or write us today.

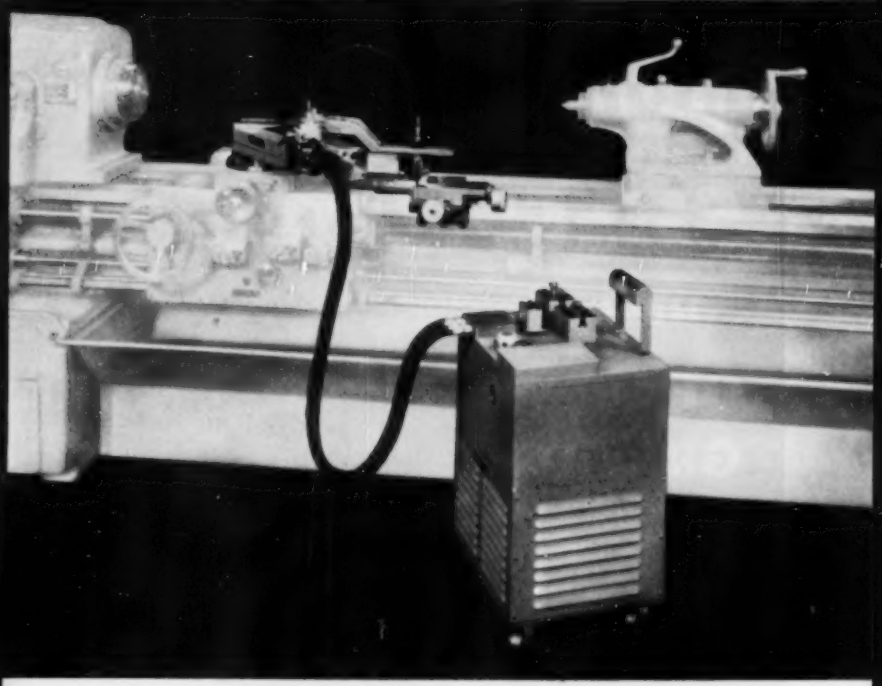
Buy a Fosmatic today—add Numerical Control Tomorrow

Any tape or card reader can be used to control a Fosmatic. And because the functions of our machine are actuated electrically, numerical control can be installed in the field—economically. You can program all or as many functions as you wish! Write or call today for complete information.

Ask for Fosmatic Jig Borer Bulletin JB-A

Don't Tool Up for Tomorrow's Boom with Yesterday's Lathes

MONARCH HIGH PRODUCTION LATHES OF TOMORROW



3..The New Air-Tracer Pak... Portable Unit for Standard Monarchs in Your Plant

Here's a real turning technique breakthrough! The Air-Tracer Pak is just what the name implies—a portable, easily applied device for temporarily or permanently adding to many standard Monarchs in your shop *all the advantages of Air-Gage Tracer production.*

And what are those advantages? In a nutshell, this, the most accurate duplicating method in general use, always outproduces manual operation up to 8 to 10 times. It sizes automatically and, using only a single running tool, is ideal for *small lot repetitive work* without the need for expensive form tools or multiple tool setups.

Its accuracy of ± .001" on most work often cuts in half the stock left for grinding; sometimes eliminates grinding and polishing. It allows complete setup change in as little as 15 to 20 minutes and tool change in 1 minute. It is also the simplest, most trouble-free of all lathe duplicating units.

The photos show how the tracer slide assembly quickly replaces the regular compound rest on the cross slide. Note the template support and micrometer dials—the portable, completely self-contained power unit at the front of machine with air supply and electrical connections in the base.

Presto! it's on. And presto! it's off. Yet it's an adaptation of the time-tested swiveling Air-Gage Tracer with the versatility to handle the more complex turning, boring and facing jobs.

This is news! Write—or phone today—for the full story... The Monarch Machine Tool Company, Sidney, Ohio.

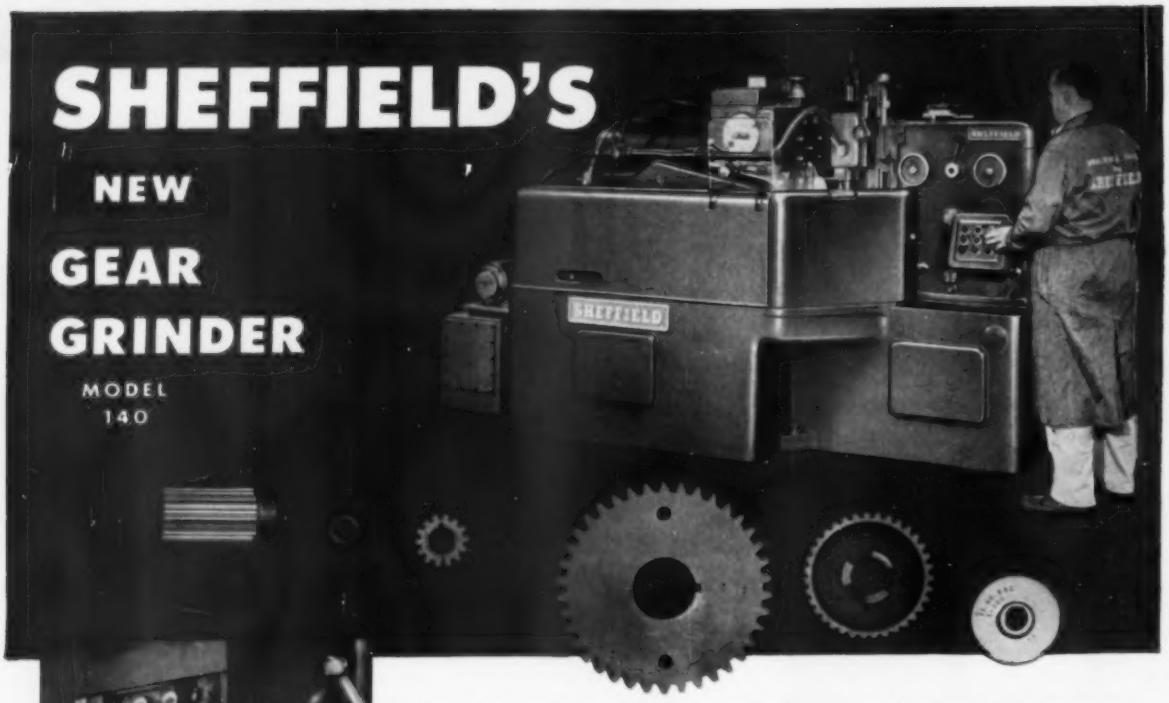
Monarch
TURNING MACHINES

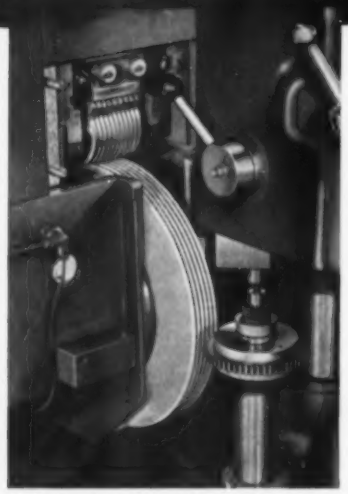
IF IT CAN BE TURNED, THERE'S A MONARCH TO DO IT BETTER AND FASTER

High-Precision Gear Production

INCREASED 300% *on*

SHEFFIELD'S NEW GEAR GRINDER MODEL 140





Relationship of crushing roll, grinding wheel and work part.

Precision gears for aircraft, fire control, servo mechanisms, guided missiles, transmissions and machine tools may be ground to a total composite error of less .0005" at production rates three times faster than heretofore possible.

The secret is a fast-cutting grinding wheel accurately crushtrued to the basic rack form, operated like a hob and with the work rotating as the teeth are ground—either from the solid hardened blank or a preformed gear.

FIELD REPORTS—An aircraft engine manufacturer says "Gears ground on the Model 140 Grinder have passed our surface tempering inspection and show no grinding burns".

A large precision instrument manufacturer, in speaking of the Model 140, writes, "We have inspected gears ground on prominent gear grinders of both American and European manufacture. Our findings have revealed that this machine is by far the most accurate to date."

MACHINE CAPACITY (Work Gear)

Outside Diameter	Up to 8"	Pitch	8 to 100
Face Width	Up to 5"	Helix Angle	Up to 45°
Distance between centers	15"		

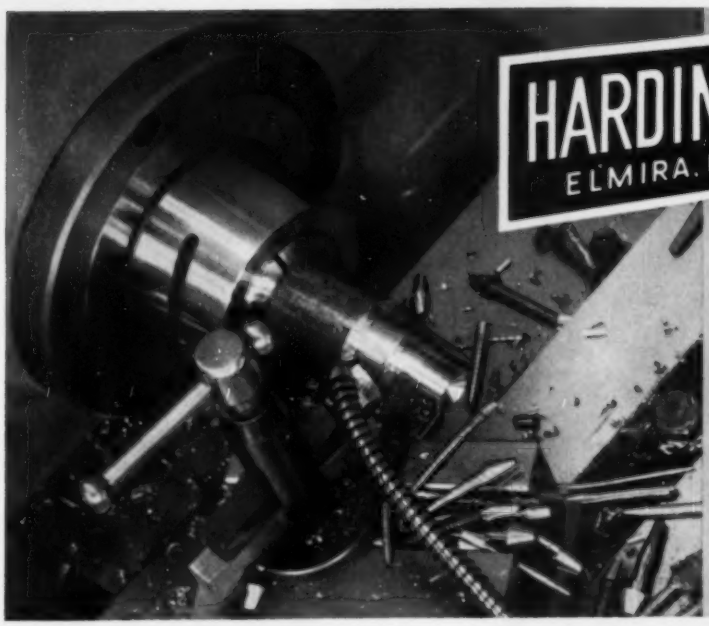
For complete information, write to The Sheffield Corporation, Dayton 1, Ohio, U.S.A., Dept. 1

7656

the SHEFFIELD *corporation*

of Bendix Aviation

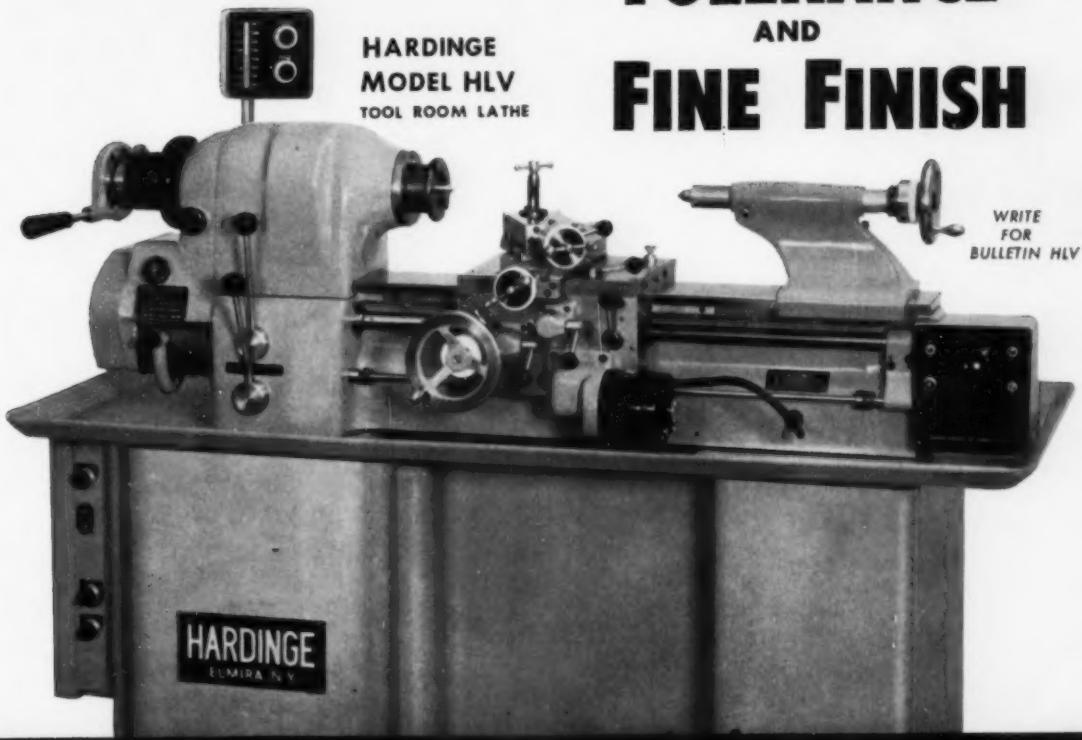
manufacture and measurement for mankind



FIRST IN TOOL ROOM LABORATORY AND DEVELOPMENT WORK

"THE OUTSTANDING TOOL ROOM LATHE" FOR CLOSE TOLERANCE AND FINE FINISH

HARDINGE
MODEL HLV
TOOL ROOM LATHE



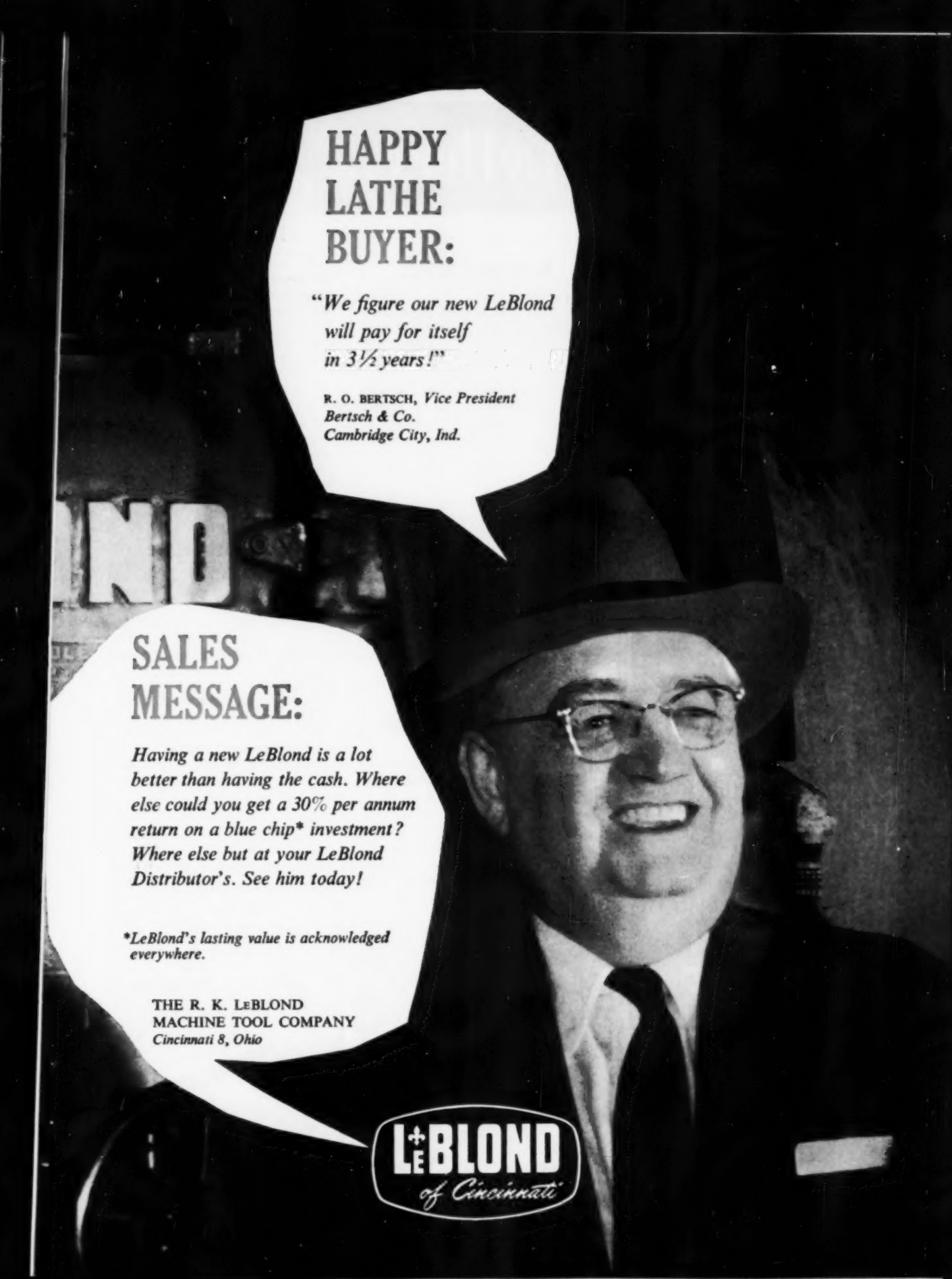
WRITE FOR BULLETIN HLV

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

Offices in Principal Cities. Export office: 407 Lafayette St., New York 12, N. Y.

HAPPY
LATHE
SALESMAN:
"This new 50" LeBlond
sold for more
than $100,000!"
O. W. "DOC" SHULL, Sales Engineer
Technical Equipment Sales Co.
LeBlond Indianapolis Distributors
LE BL


HAPPY LATHE BUYER:
"We figure our new LeBlond will pay for itself in 3½ years!"
R. O. BERTSCH, Vice President
Bertsch & Co.
Cambridge City, Ind.
SALES MESSAGE:
Having a new LeBlond is a lot better than having the cash. Where else could you get a 30% per annum return on a blue chip* investment? Where else but at your LeBlond Distributor's. See him today!
*LeBlond's lasting value is acknowledged everywhere.
THE R. K. LEBLOND MACHINE TOOL COMPANY
Cincinnati 8, Ohio
LEBLOND of Cincinnati

SEE YOUR
CAPEWELL DISTRIBUTOR

for
hand hack saws
power hack saws
hole saws
band saws
hammers
ground flat stock
and for quick
dependable service
on all your
industrial needs

INDUSTRIAL DISTRIBUTORS
SERVING INDUSTRY ECONOMICALLY
THE RIGHT HAND OF PRODUCTION

CAPEWELL

THE CAPEWELL MFG. CO.
HARTFORD 2, CONN.

Letters...

To American Machinist
330 W 42nd St, NY 36, NY

Manganese bronze

Dear Sirs:
On your "Materials" page (*AM* Dec 15 '58, p79) there is an article about Superston Manganese Bronze marketed by the Superston Corp.

We would appreciate it if you will forward the address of this company and the name of the individual to whom we should write.

Henry Binus
Canton, Ohio

The Superston alloy was developed by J Stone & Co, Ltd of England. An American company named Superston Corp is now being formed.

For further details we suggest you write to Ampco Metal, Inc, which is one of the firms involved in forming the corporation: Mr J P Henry, Ampco Metal, Inc, 745 South 38th St, Milwaukee 46, Wis —Ed.

How to get MIL specs

Dear Sirs:
In your Reference Book Sheet, "True-Position Tolerancing XVII" (*AM*—Oct 20 '58, p189), there is a reference to a standard which covers geometric symbols.

We would like to procure a set of the standards—MIL-STD-8A—and wonder if you could inform us where to send this request

Harry R Bach
Rockford, Ill

This standard and all other military standards and specifications can be secured from the Superintendent of Documents, Washington, DC A price list is available on request—Ed.

Here's a challenge

Dear Sirs:
I am faced with a rather serious problem and none of my usual sources including AMERICAN MACHINIST, seem to be able to offer an answer. I wonder whether your readers might be able to help me?

For some special tests, it is necessary that I produce a number of straight holes, having flat bottoms, in stainless-steel plates. These holes cannot be more than 1/16 in. in dia and they must be at least

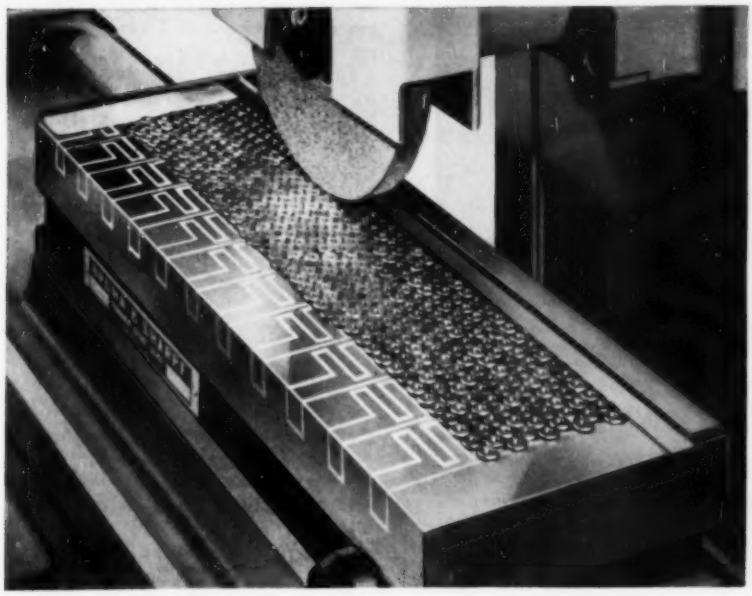
SHOPMATES

N. Jarvis

...SO YOU KILL YOURSELF TO FINISH ON TIME...
SURE YOU'RE TIRED — SO AM I... BUT!! IF WE DON'T GET THIS CHIP CLIPPER DONE TONIGHT THE COMPANY'LL LOSE OUR SHIRT!
N. JARVIS
...SO SIX MONTHS LATER...

Precision Tool News

No. 10 — REPORTING NEW DEVELOPMENTS AT BROWN & SHARPE'S PRECISION CENTER



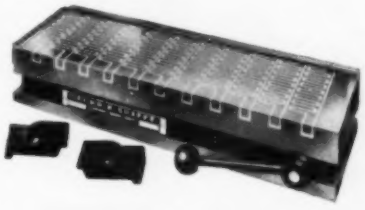
Very small parts or thin strips held tightly and accurately on new B&S Fine Mesh Permanent Magnet Chuck

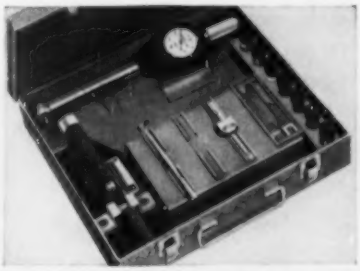
Magnetic poles are closer together on this new Brown & Sharpe chuck than on any other permanent magnet chuck. Closest spacing in the pattern is 3/32", and at no place within the magnetic area are poles more than 3/16" apart. As a result you can hold smaller parts — anywhere inside the area — without worrying about weak spots.

The extra-fine mesh also holds long, thin strips perfectly flat — without the waves that are apt to develop in strips when they're held on chucks with wider pole spacing.

You get exceptional accuracy with this chuck, because of its extra-thick, rigid top plate — that doesn't deflect or sag when the chuck is turned on. And, the thick top plate lasts longer, too — it can be dressed down a full 1/2".

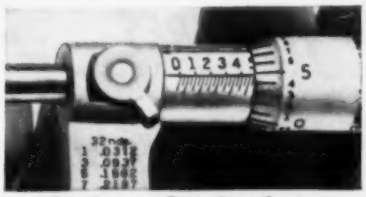
Brown & Sharpe's Fine Mesh Rectangular Permanent Magnet Chuck, No. 618-3, provides a working surface of 6" x 18"; magnetic surface for small, thin parts of 4 3/16" x 16 3/16". For larger, thicker pieces, its magnetic surface is a full 6" x 16 3/16".





New B&S Dial Bore Gage Set Saves Up to 50% Cost Covering 1/8"-1" Range

Interchangeable arbors and measuring heads are used with one basic indicator assembly in the new Brown & Sharpe economy Dial Bore Gage Set. It covers measurements from 1/8" to 1", by .0001" — yet sells for only about $400 — *half* the cost of separate gages for this range. A bore-gage setting device that eliminates the need for setting rings is included.



Oblique Graduations on New B&S Micrometer Prevent .025" Errors

Patented oblique (slanting) graduations on the *barrel* of Brown & Sharpe's Convertible Thimble Micrometer show quickly "where you've been and where you're going." They are still visible when older style straight graduations are hidden. They prevent the unfortunate .025", one-revolution errors that so often occur.

Other features: Thimble converts quickly to either friction or fixed type — floating, thumb-operated lever clamp. Personalized with initials at no extra cost. No. 1011 — Range, 0" to 1", in .0001".

Ask your B&S industrial distributor to show how these new tools can save money or time in your own operation. Brown & Sharpe Mfg. Co., Providence 1, R. I.

Brown & Sharpe

INDUSTRIAL PRODUCTS DIVISION

PRECISION TOOLS AND GAGES
SCREW MACHINE TOOLS
SHOP ACCESSORIES

PROGRESS IN PRECISION FOR OVER 125 YEARS

INDUSTRIAL DISTRIBUTORS — THE RIGHT HAND OF PRODUCTION

LEADERS IN INDUSTRY MARK WITH NOBLEWEST

HEAVY DUTY ROLL-O-MARK

MULTI-PURPOSE METAL MARKING MACHINE

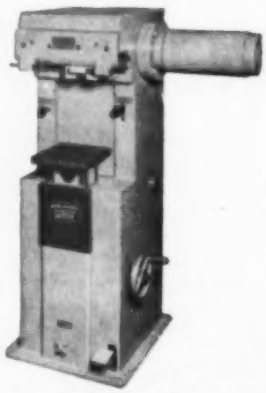
Noblewest's Roll-O-Mark with horn-style work holding fixture for marking the O.D. surface of large diameter rings.

FEATURES

- *Extra large work capacity*
- *Greater versatility*
- *Marks, numbers, graduates, embosses*
- *Low operating cost*

Marking the surface of large diameter rings is just one of the many applications that are being done faster, better and at lower cost in many industries today with the new heavy duty all-pneumatic Roll-O-Mark. This one machine can be tooled for marking round or flat surfaces . . . precision graduating . . . serial numbering . . . knurling . . . and embossing. Whatever your needs for metal marking, Noblewest makes the machines, marking dies, and work-holding fixtures for doing the complete job. And remember, Noblewest Roll-Marking is *permanently indented* marking—*good for the life of your product.* There is a Noblewest representative near you. Write for new catalog. The Noble & Westbrook Manufacturing Company, 17 Westbrook Street, East Hartford 8, Connecticut.

A few desirable territories open to qualified representatives.



All-pneumatic, Model 365 is the heavy duty version of the famous Model 50PI.

MARK IT BEST WITH NOBLEWEST IMPROVED MARKING DEVICES

NOBLEWEST

ORIGINATORS OF THE ROLL MARKING PROCESS

MARKING
NUMBERING
EMBOSSING
GRADUATING

1 in. deep. Also, the holes must be straight. Flat bottoms are essential.

So far I have tried spade drilling, conventional drilling and lapping, and ultrasonic drilling without success. The best result was obtained by shooting a pin into the plate and then extracting it, but even this is far from ideal. Some of my friends say the flat bottom requirement makes the job impossible—but I can't give up.

One fellow has suggested electrical discharge machining. Before I get any deeper into equipment and lost time, I'd like more assurance and a better idea of what's practical.

In a couple of years the hole diameter will have to be 1/64 in. I know, but 1/16 in. will serve very nicely now. Can you help me?

Name Withheld

Roundness tester

Dear Sirs:

Referring to your Special Report No. 467 on Roundness, will you kindly give us the name and the address of the firm that makes the Talyrond roundness testing machine (*AM*—Dec 1, 58, p118)?

W Wallace McKaig
Cumberland, Md

The Talyrond machine is manufactured by Taylor, Taylor & Hobson, Ltd, Stoughton Street Works, Leicester, England.

However, the company is represented here in the United States by Engis Equipment Co, 431 South Dearborn Street, Chicago, Ill (E J Schneider, Sales Manager)—Ed.

"But good heavens! I was under the assumption that manual labor was obsolete."

CALENDAR

Society of Automotive Engineers—National Aeronautic Meeting, Production Forum, and Display, Mar 31-Apr 3, Hotel Commodore, New York, NY.

American Welding Society—Annual Meeting and Exposition, Apr 6-10, Sherman Hotel and International Amphitheatre, Chicago, Ill.

American Foundrymen's Society—Engineered Castings Show, Apr 13-17, Sherman and Morrison Hotels, Chicago, Ill.

Armour Research Foundation and Institute of Radio Engineers—Conference on Industrial Instrumentation and Control, Apr 14-15, Illinois Institute of Technology, Chicago, Ill.

American Society of Tool Engineers—Annual Meeting, Apr 18-22, Schroeder Hotel, Milwaukee, Wis.

Metal Powder Industries Federation—Annual Meeting and Powder Metallurgy Show, Apr 20-22, Sheraton-Cadillac Hotel, Detroit, Mich.

Metal Treating Institute—Spring Meeting, Apr 23-25, Hollywood Beach Hotel, Hollywood-by-the-Sea, Fla.

Nation Screw Machine Products Association — Annual Meeting, Apr 26-30, Roosevelt Hotel, New York, NY.

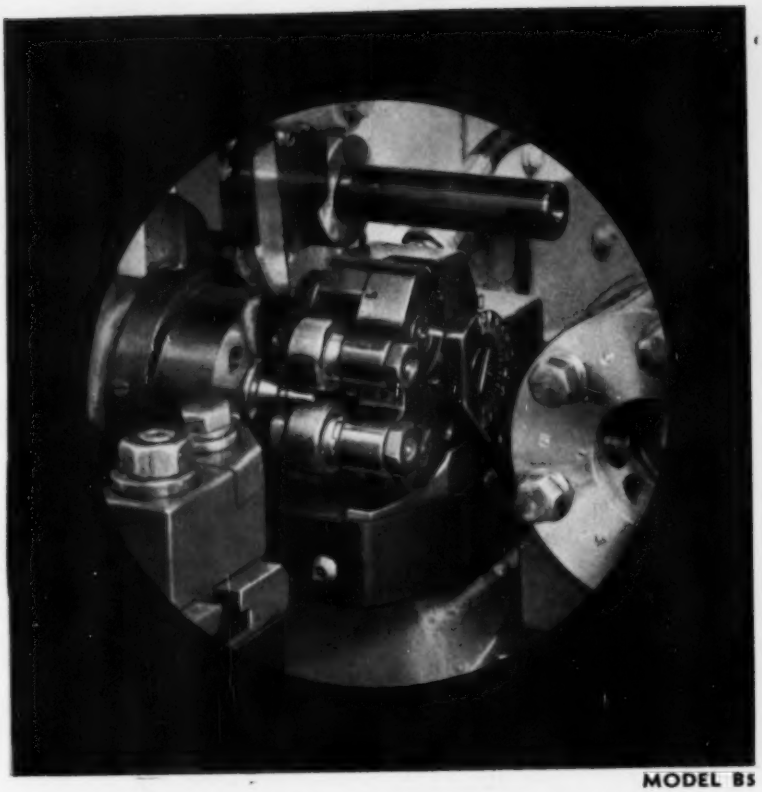
Grinding Wheel Institute & Abrasive Grain Asociation — Semi-Annual Meeting, Apr. 27-29, The Homestead, Hot Springs, Va.

American Society of Mechanical Engineers—Metals Engineering Conference, Apr 29-May 3, Albany, NY.

American Institute of Electrical Engineers — Automatic Techniques Conference, May 11-13, Pick-Congress Hotel, Chicago.

American Society of Mechanical Engineers — Production Engineering Conference, May 12-14, Statler-Hilton Hotel, Detroit.

Machinery Dealers National Association — Annual Meeting, May 13-15, Plaza Hotel, New York, NY.



MODEL BS

New Thread Rolling Attachment for # 00 *Brown & Sharpe*

- *Reduces Pressure on Spindle*
- *Produces Higher Quality Threads on steel, brass and aluminum*
- *Increases Threading Capabilities*
- *Eliminates Secondary Operations by Threading Behind Shoulders*
- *Threads Rolled Close to Collet*
- *Reduces Inspection Costs*

With this latest Reed Attachment the threading capacity of your #00 Brown & Sharpe can be greatly increased. The attachment has a diameter capacity of up to 1/16 inch and maximum thread length of 1/2 inch. It is easy to set up and operate and precision adjustments assure accurate matching and positioning.

REED RD TRA-174

REED ROLLED THREAD DIE CO.

Specialists in Thread and Form Rolling Tools and Equipment

HOLDEN, MASSACHUSETTS, U S A.

Sales Offices in: Buffalo, Chicago, Cleveland, Compton, Calif., Denver, Detroit, Englewood, N. J., Houston, Indianapolis, Milwaukee, Montreal, New York City, Phila., Pittsburgh, St. Louis, Syracuse, Toronto

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LO-AIR

low temperature-air hardening*
TOOL and DIE STEEL

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Brochure No. TS-101 gives you the facts on LO-AIR, the modern cold work die steel which provides ease of machining with maximum hardenability. This means lower cost—safer die making. Due to the balanced combination of carbon, chromium, manganese and molybdenum, LO-AIR can be heat treated at low temperatures, resulting in excellent dimensional stability—*and* at no increase in hardening costs over oil hardening tool steel (AISI 01). LO-AIR is now available from branch warehouse stocks. Order a bar today!

*U.S. PAT. NO. 2,355,284

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BRIDGEVILLE, PA.

TOOL STEELS • STAINLESS STEELS • HIGH TEMPERATURE METALS

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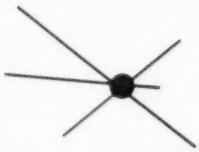
CIRCLE 269 READER SERVICE CARD ►



BUHR

MACHINE TOOL COMPANY
specializes in the design and construction of practical versatile multi-operation machine tools.

Basic features stressed in all Buhr machine tools include:

QUALITY—rugged design and manufacturing accuracy are combined to provide long trouble-free operation.

CONVERTIBILITY—Buhr uses standardized "building-block" parts wherever possible in its machines, fixtures, etc. All such parts are held to interchangeability tolerances.

PRODUCTIVITY—dependability is designed and built into Buhr machines to insure maximum productivity per man-hour consistent with production requirements.

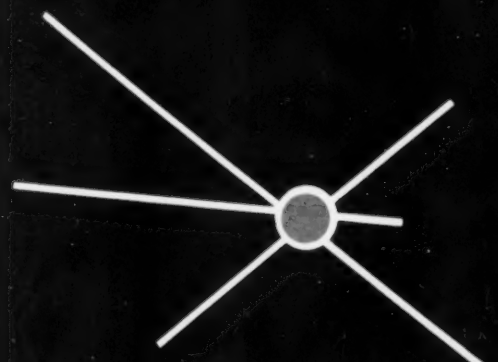
LOW DOWN TIME—every effort is made to minimize downtime by careful attention to future maintenance requirements, etc.

VERSATILITY—Buhr machines have a well-earned reputation in industry for their versatility. Many can produce a variety of parts with minimum changeover time.

Buhr welcomes the opportunity of discussing your machining requirements. Give us a call or drop us a line.

BUHR
MACHINE TOOL COMPANY

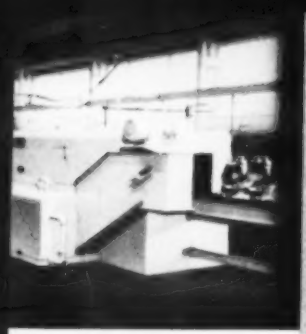
ANN ARBOR, MICHIGAN



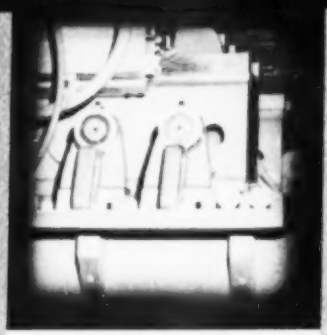
BUHR

the symbol of quality in multiple operation high and low production equipment

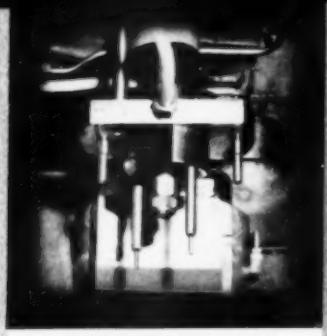
two more examples



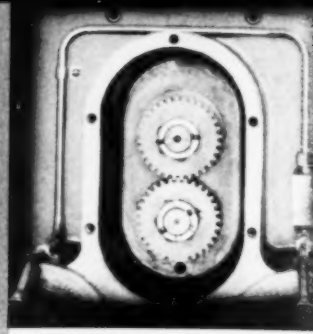
CLEANLINESS: Fixtures and parts are washed on return conveyor.



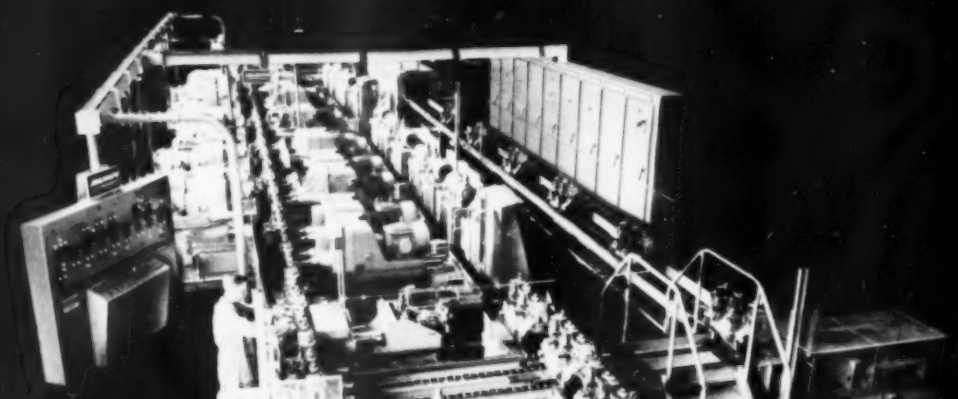
SETUP & TOOL CHECK gages are provided at all key stations.



PROBING stations at key points locate and signal any tool breakage.



CHANGE GEARS in heads for changing cutting speeds if desired.



PRECISION IN HIGH PRODUCTION

Tolerances as close as a few tenths can be maintained on Buhr ECONOMATICS when required

PART—hyd

CYCLE TIME-

OPERATIONS

STATIONS, to

OPERATIONS-
reamin
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TOLERANCES-
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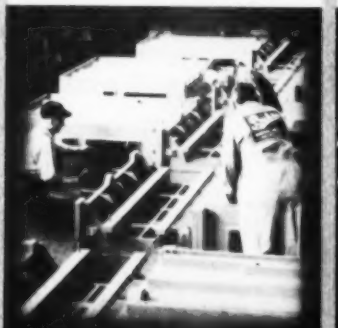
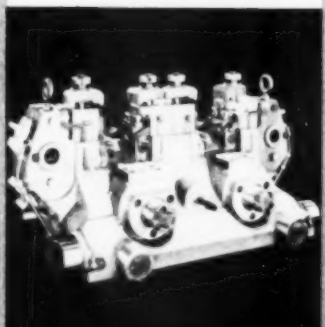
SPOT GAGING of parts in process without stopping machine.

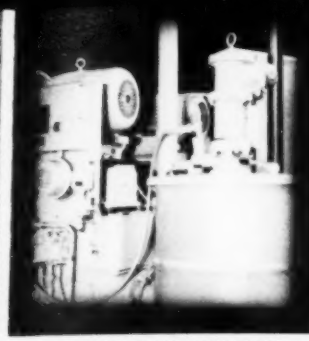
BUHR "BUILDING-BLOCK" construction does not sacrifice rigidity.



PRECISION BUILT FIXTURES give 100% parts interchangeability.



CONVERTIBILITY is further aided by providing 10 future potential work-stations.



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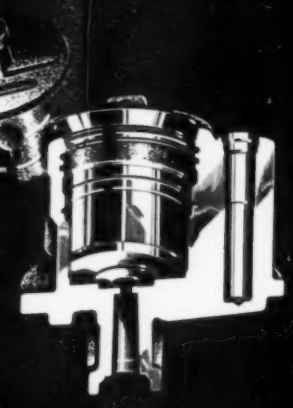
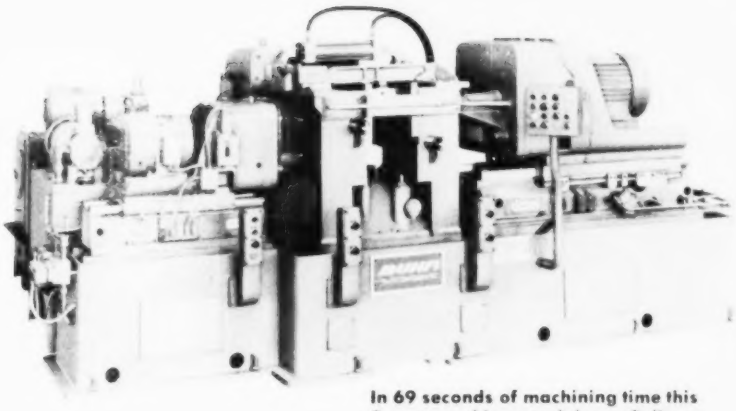
AUTOMATIC LUBRICATION of entire machine except motors.



—hydraulic pump housing
TIME—24 secs. for 2 parts
ATIONS—115
ONS, total—26 stations
ATIONS—drilling, tapping, reaming, spot-facing, boring, orm-grooving, feed-out facing, probing and gaging
ANCES—as low in some cases as a few tenths of a thousandth with excellent surface finish

er
ons.

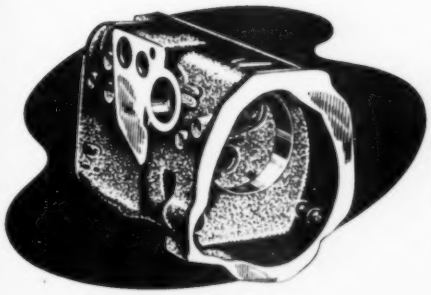
GOOD ACCESS for tools etc., provided by ample room between stations.



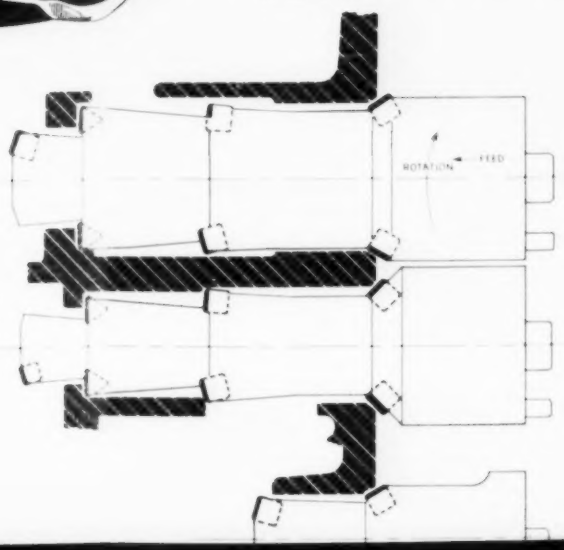
In 69 seconds of machining time this 3-way machine rough bores 9 diameters, semi-finishes 4 bores, machines 7 chamfers and 3 faces.

ECONOMATICS SAVE MONEY IN LOW PRODUCTION, TOO

By combining numerous operations through multi-diameter boring tools, using throwaway inserts, only 4 simple 2-way and 3-way Buhr Economatics produce all bores in the transmission housing for one of the major tractor producers.



Diagrammatic sketch below shows the three spindles of the right-hand head of the machine illustrated above. Throw-away inserts are combined in specially designed tools to rough bore, chamfer and face various openings. Related dimensions can be held closely because they are formed by the same tool. Tool grinding is unnecessary and set-up time is minimized.



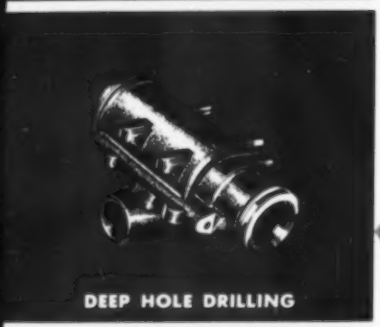
Typical jobs on various *BUHR* Economatics

Any random selection is naturally incomplete. If you don't see a part that looks like yours, send us a part print and we will be happy to tell you what Buhr Economatics are doing to cut costs on your type of part.

AXLE HOUSING

On this part, a short Buhr Economatic transfer machine has eliminated an annual retooling cost averaging $40,000 per year.

Short Transfer Machine #C-5188



DEEP HOLE DRILLING

On this conventional Economatic, a ¼" hole is drilled 7¾ in. deep in 5 steps (2 parts at a time). A proximity switch stops machine if a drill should break.

Dial Index Machine #C-5117

VALVE BODIES

From 19 to 28 operations per part are performed on 32 different valve body styles on the same machine with only simple tool changes.

Trunnion Machine #C-5021

CONTROL ARM

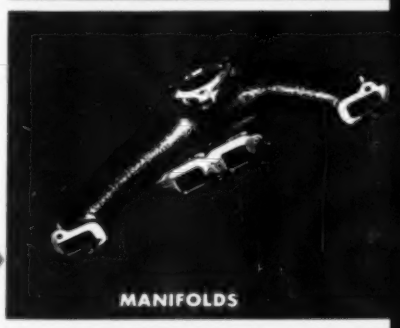
A 4-station 3-way (2 horizontal, one vertical) dial index Economatic for drilling, reaming and facing control arms.

3-way Machine #C-4005

ROAD MACH'Y PARTS

7 different road machinery parts are produced on one automatic machine. Settings for different parts are pre-selected with a dial switch.

Shuttle-type Machine #C-4552



MANIFOLDS

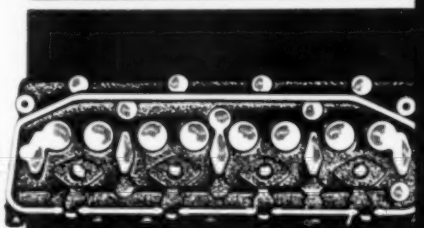
Cast manifolds (both LH and RH) are produced at a rate of one every 21 seconds on a 20-station machine.

Transfer Machine #C-4524

ALUMINUM OR CAST IRON

43 operations are performed on either aluminum or cast iron housings at 21 stations. Time cycle is 21 seconds per part.

Transfer Machine #C-4098



CYLINDER HEADS

All spark plug holes are combination drilled and reamed on a simple 2-fixture 4-station machine with a 12-spindle head.

Single-station Machine #C-4941

Ask for more information by machine number

BUHR MACHINE TOOL COMPANY

ANN ARBOR, MICHIGAN

SPOT NEWS...

- **The Soviets claim they have a metal with nearly 2 million psi** tensile strength—almost the theoretical maximum strength any metal can attain. There are only a few samples of these super-strong metals, but a Moscow technical magazine predicts usable metals for industry with a tensile strength of over 400,000 psi within the next decade. Soviet theoreticians estimate that absolute tensile strengths can be calculated at roughly 1000 times present levels. Research to produce these high-strength metals involves alloys and heat-treatment.

- **Moving machines and presses in a plant** to match varying production needs is advocated by George McKewen of Barry Controls Inc, speaking at the recent Pressed Metal Institute Meeting. "Don't anchor machines to the floor," he said, "—instead mount each machine on standard leveling machinery mounts . . . so it can be moved around by fork truck." Also advocated: quick-disconnect electric and air connections. Using this method, he said, two men can position and connect a press in 10 min.

- **Army will spend $500 million in the Detroit area this coming year** ($100 million more than last year) for tanks, trucks, missiles, etc. Top contractors: GM, Ford, Curtiss-Wright, Continental, Reo.

- **Lukens Steel will research and develop record-size HSS sheet** for rocket engine casings for the Navy. Lukens R & D will take off from a base of its already-in-existence development: HSS steel sheet 160 in. wide and 182 in. long, nearly double the size of biggest commercial sheet.

- **A Swedish firm has just licensed electro-slag welding** (*AM*—Jan 12 '59, p106) from the Russians, plus the right to manufacture two types of welding machines. Russians are also passing along their experience with it to Red China, Czechoslovakia and Poland.

- **Auto crankshafts are now being cast from pearlitic malleable iron** modified with additions (ArmaSteel) by General Motors' Central Foundry Division—in green sand molds instead of shell molds. They're being used today on '59 Pontiac models, at a big savings over forged crankshafts, GM claims.

- **Long-awaited open investigation of the Renegotiation Act** will be started by Congress immediately after the Easter recess. Meanwhile, a bill is being introduced to liberalize (revamp present rulings on excessive profits) the controversial law, which expires June 30.

- **An aluminum submarine that can submerge to a depth of three miles** is now in the second of five stages of construction at Reynolds Metals.

- **It is unlawful for a union to continue picketing a firm** after its employees have voted they do not want to join the union in question, the U S Court of Appeals in San Francisco has ruled. But the union can put said firm on its "We do not patronize—" listings.

- **The Nike-Zeus antiaircraft missile won't go into production this year.** Defense Secretary McElroy has turned down Army's plea for $700 million to tool up and start production on grounds that he first wants to make "an intensive study of pre-production planning aimed to shorten the time between freezing of design and start of production."

- **Pipe and tubing that can twist and bend without breaking** (particularly good for underground gas and water service mains) has been produced from a new ductile iron developed by American Cast Iron Pipe Co, Birmingham.

- **Congress will shortly ask "Why doesn't the U S have an atom plane?"** The big question: "Why after 12 years and $850 million don't we have at least a prototype?" Investigation will start soon in answer to an Air Force complaint that its proposal to start building the first prototype has been turned down by the administration, which is unwilling to sink more money into a project it isn't sure will get off the ground.

HALT

heat damage to carbide tipped tools

SIMONDS PLATE MOUNTED WHEELS

(OPEN STRUCTURE)

with NEW V9 BOND

Simonds GC Electrolon (green silicon carbide) grinding wheels are made with very open structure by a new method to produce the desired voids or pore spaces . . . for cooler, faster grinding.
The new V9 vitrified bond is a chemically designed glass bond more controllable for more uniform grinding action.
Furnished plate-mounted for all grinders. Typical specifications for carbide tool grinding: GC60-H12-V9 for roughing; GC120-H12-V9 for finishing.

CALL YOUR SIMONDS DISTRIBUTOR

Proven products
Dependable know-how
Quick supply

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WASHINGTON...

No Bulletin F revision...

Bulletin F—the Treasury's guide to the tax life of capital equipment—may not be revised after all. It is practically official now.

The reason is this—after two or three years of consultation with advisory committees, formal hearings with interested parties, etc., the top officials of Internal Revenue Service and Treasury have decided that they'll be better off (and so will the taxpayer) if no revision is published.

Here's the reasoning: Treasury officials hope that, over the years, the present Bulletin F (now 17 years old) will gradually become less and less of a guide. The present version, they admit, is outmoded and not a reliable guide to what taxpayers should be paying. This is exactly what officials want to happen—they want the Internal Revenue agent and the individual taxpayer to work out (on an individual basis of realistic judgment) the tax life of equipment, based on the taxpayer's own experience.

Bulletin F less important...

For years, IRS officials have been trying to wean their agents away from Bulletin F as an absolute standard. They've been stressing that the taxpayer's actual usage takes precedence over the suggested tax life listed in Bulletin F. They now feel that this campaign is getting results—and that if no revision is forthcoming, then the present Bulletin F will become increasingly less important.

Undersecretary of Treasury Fred Scribner notes that "many false hopes have been raised about what a revised Bulletin F might contain." He worries that a revised Bulletin F, with all the attendant publicity bound to surround its issuance, would be accepted as gospel by the revenue agents, and would be used to "over-ride the actual experience of the individual taxpayer."

Some estimate might be made of how much obsolescence could be expected in a given period, he said, and a given range of tolerance established to account for the necessary uncertainties, but "We are moving so rapidly and developments are coming with such frequency that these estimates might be, at best, educated guesses."

Additional notes on depreciation policy:

- **Treasury may back legislation** to require sellers to pay ordinary income taxes on receipts from the sale of depreciated property. Under existing law, many taxpayers are allowed to take the lower capital gains tax rate.
- **Top officials** are still against any move to base depreciation rates on the replacement cost of equipment, instead of being based (as now) solely on original cost.

More for defense assured...

It's a foregone conclusion the administration's $41-billion defense budget for next year will be hiked by Congress. An increase of some $700 million seems most likely—with the bulk of the extra funds earmarked for more procurement of ballistic missiles.

A Congressional atmosphere conducive to a defense budget boost has been whipped up by the Berlin Crisis and the Service Chiefs' highly-publicized "reservations" about the administration's budget proposals.

Air Force generals have told the House Defense Appropriations Subcommittee in closed session they "could use" $700 million to effectively step up the ICBM program. Note that Rep Mahon (D, Tex), the Subcommittee's influential chairman, has already forecast an increase of this exact amount.

Titan vs Atlas...

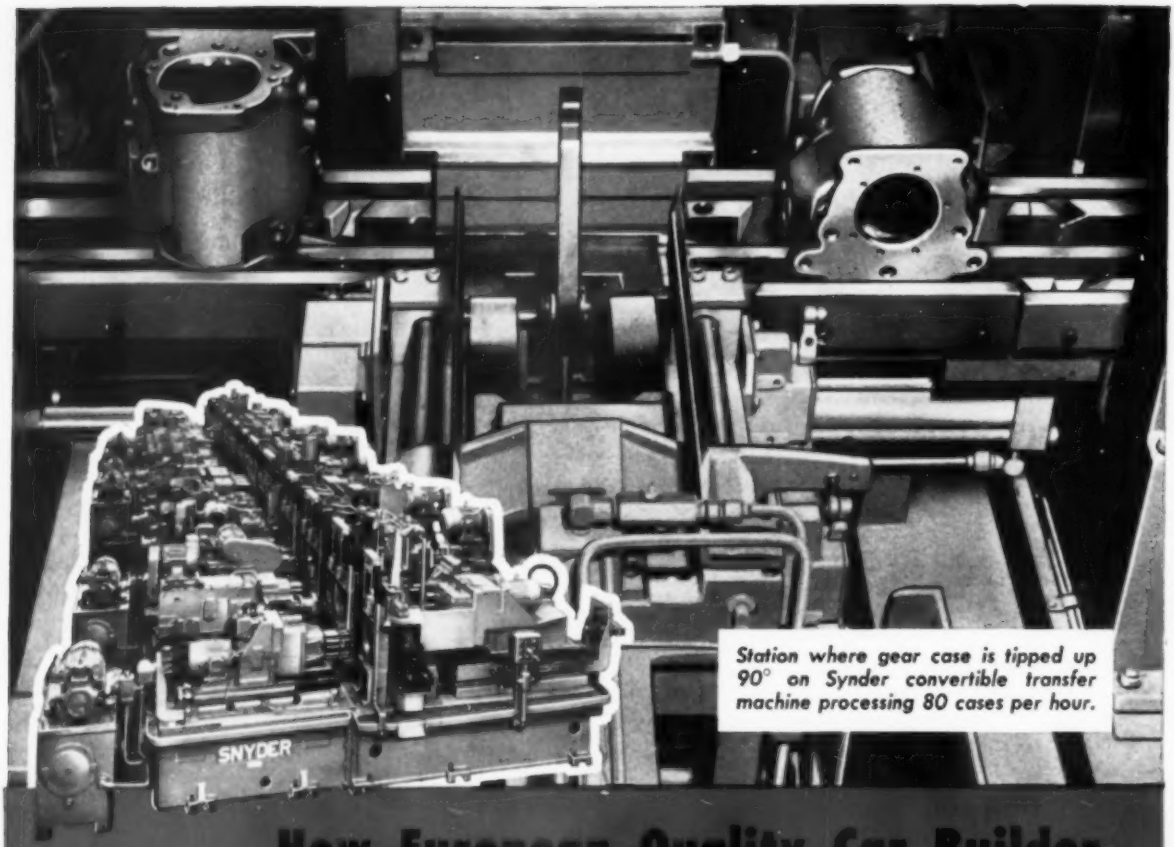
Rival ICBM builders—Convair-North American Aviation-GE on Atlas vs Martin-Aerojet-Arma-Avco on Titan—are already scrambling for the new orders.

The contractors' Pentagon politicking is reminiscent of the long-simmering, never-resolved Thor-Jupiter IRBM competition of recent years.

Current Pentagon plans call for 9 Atlas and 11 Titan squadrons—10 missiles to a unit. In addition, both the Defense Dept and NASA, the new civilian space agency, are buying still more of the missiles to launch space vehicles. The extra $700 million would not necessarily mean expanding ICBM schedules. The additional money could result mainly in acceleration of production rates, pushing the 20 ICBM squadrons into operational status one year earlier than now planned.

Actually, the Pentagon considers the Atlas-Titan production plans quite flexible. The ICBM mix is still subject to change as a result of missile tests and technological developments. That's why the two contractor teams are now busy lobbying here.

Convair's big pitch on Atlas is that (1) production tooling is already in place to allow for an immediate spurt in output (Titan lags behind timewise), and (2) later models of the missile will have the more advanced all-inertial guidance system originally designed for the rival Titan.



Station where gear case is tipped up 90° on Synder convertible transfer machine processing 80 cases per hour.

How European Quality Car Builder Snyderizes for the Soaring Sixties

This new 53-station transfer machine combines special purpose efficiency with high convertibility for later changes. Part orienting devices enable Snyder to utilize standard horizontal way-type units to drill, spotface, chamfer, ream, line-ream, mill and bore this cast iron standard gear transmission case on all faces. The cases are turned 90° at the thirteenth station and tipped up 90° at the thirty-eighth station, which eliminates vertical machining units. The part is specifically located on faces not subject to future design changes, thus reducing future capital expenditure.

★ ★ ★

Let us show *you* how to SNYDERIZE FOR THE SOARING SIXTIES for more efficient parts handling, gaging, assembly and machining. Send or phone for new brochure with resume of Snyder machines engineered for profit improvement.

Standard Features of Snyder Machines

1. SNYDER SELF-CONTAINED UNITS and other units equipped with hardened and ground steel ways.
2. Threading and tap heads equipped with individual lead-screw spindles.
3. Minimum downtime for tool changes because spindles are arranged for pre-set cutting tools.
4. Automatic lubrication.
5. J.I.C. Standards throughout.
6. Electrical interlocks and full depth circuit throughout.
7. Panels equipped with SNYDER CIRCUIT SLEUTH.

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Phone: LO 7-0123

DETROIT...

Fair weather still...

Speaking on closed circuit television, ebullient Chrysler President "Tex" Colbert told his dealers that "there is opportunity ahead this spring and the conditions are right for doing a lot of business." He backed this up by programming a half-million cars and trucks for production between March and August.

Meanwhile, Cadillac, delivering 12,649 cars, posted its biggest February in a 57-year history. This record also applies to any previous successive three-month period. Cousin Oldsmobile's February total was 15% ahead of last year, and more significantly, daily sales rates continue to climb.

Chevrolet truck sales enjoyed the most dramatic February climb—28,000 units was the third highest total in the company's history, being exceeded only in 1951 and 1953. Chevy's passenger car production is currently being trimmed to market size, but only slightly. Sole cloud on the GM horizon is Buick, which faces cutting back its present 1500-cars-per-day output on March 24 to the extent where it will eliminate 4500 jobs. Nevertheless, Buick should produce over 400,000 units this model year for the seventh best season in its history.

Ford and the independents are continuing to improve their market position. The last week of February saw best Edsel sales of the model year to date. Mercury increased its sales 21% over the previous February and Ford itself was ahead a healthy 53%. Studebaker's Lark now commands 2.71% of the domestic market—triple its share of a year ago. And from Toledo comes word that sales of the durable Jeep for the first two months of the year exceeded the entire first quarter of 1958.

Behind the gauze curtain...

The Big Three, each visibly pregnant with a small car program, are about to give royal birth. Ford, in the manner of a palace chamberlain, formally admitted its condition via an annual report to stockholders. A few days earlier, Chrysler's Colbert was trapped by newsmen into acknowledging the prospect, but defying nature said that actual labor was predicated on the action of others. Chevrolet is still officially silent, even though hordes of obstetricians are busy preparing the Buffalo foundries and the Willow Run delivery site.

Knitting started in all seriousness with final awareness that George Romney's Ramblers, Harold Churchill's Larks, and some 40-odd varieties of imports were collectively going to be transport for about 960,000 new American owners before this year is out. Volkswagen dealers, in fact, currently lead all makes in average sales per outlet.

Horsepower again?...

Tongue in cheek, a leading engineer told us that if the Dow Jones stock average cracks 1000, there will be 400-hp Fords.

Seriously, his quite sage observation was based on a definite correlation between recession and gasoline economy, prosperity and horsepower.

Fast-moving Detroit is already prepared for the possibility that the two-year-old ban on stock car racing might quietly go out the window hand-in-hand with the late recession. Nascar's recent Speed Weeks at Daytona Beach were a good clue.

Many engineers and even car division presidents sincerely hope that there can be a return to factory participation in stock car racing and other performance events, but not necessarily with the excesses evidenced during the win-or-else peak of 1956. Engineers feel that de-emphasizing performance stymies such legitimate advances as fuel injection. Car division presidents, on the other hand, realize that a good racing record can sell a car to many persons whose horns are not honked by talk of increased gasoline economy.

The price of progress...

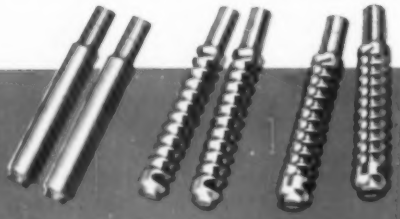
First confirmation of Chrysler switching to unitized body construction for the 1960 model season comes from Midland-Ross. The supplier of frames has notified 2400 employees that it will close its Detroit plant late in the summer. The company has been unable to find work for its specialized machines to replace the Chrysler business.

And Checker again...

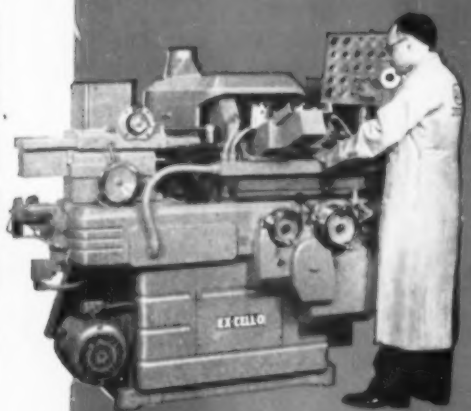
Auto writers still have dusty telegrams inviting them to a December 1958 preview of the "Superba." This car, it will be remembered, was to be a family version of Checker's beefy, seven-passenger taxis. President Morris Markin claims introduction was delayed by unexpectedly heavy orders for the commercial product. He now plans to unveil his boon to prolific families at the International Automobile Show in New York's Coliseum on April 4.

Precision Threads Roughed And Finished

Automatically!



Automobile steering gear ball-race screws in three stages of processing: blanks, rough-ground, and finish-ground.



Ex-Cell-O Style 33 Thread Grinder equipped to automatically grind steering gear ball-race screws.

These automobile steering gear ball-race screws are rough-ground from the solid on an Ex-Cell-O Thread Grinder. This operation was formerly done by thread hobbing or milling. The screws then go into the machine illustrated, an Ex-Cell-O Style 33 Thread Grinder, equipped for automation. It self-loads, locates, finish-grinds, and ejects steering gear screws. What's more, when desired, the wheel can be automatically dressed after completing a predetermined production. It increases hourly per-unit output over manually operated machines while actually decreasing the number of rejects. A double saving.

Ex-Cell-O Precision Thread Grinders come in a wide range of models—some best suited for toolrooms and short runs, others designed for fully automatic, high volume output. In all, there are five models adaptable to any production requirement.

Why not find out today how these Ex-Cell-O Precision Thread Grinders may be able to reduce your per-unit costs? For full information, just call your nearby Ex-Cell-O Representative.

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EX-CELL-O CORPORATION Machinery Division

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CIRCLE 275 READER SERVICE CARD

AIRCRAFT and MISSILES...

TRENDS

Steel machining at Convair...

Details are beginning to come through on the Air Force's just-started $135,000 machining-with-the-aid-of-coolants project at Convair-San Diego. The coolants will be carbon dioxide and ABC 0 156 solvene (a mixture of Stoddard solvent and trichlor-ethylene). Coolants will be used separately—never together.

Idea is to do something about those steels that are easy to work at room temperatures, almost impossible at temperatures of 900-1200 F.

For that reason, five steels that are soft at room temperatures, tough at high temperatures, have been picked for the experiments: L-605, 8-286, R-235, H-11 and Ti-Moly.

Several experiments are planned to get machining temperatures down:

- Machining the steels while they are submersed at least partially in a coolant (flooding).
- Mist cooling.
- Using a cutting tool with a hole in the cutting head through which coolant flows onto the metal.

Another idea is to place the steels into cold chests to lower the temperature of the steel to –120 F to –150 F, then to take the steel out and machine it until its temperature goes up to –75 F. Then the steel is returned to the chest to cool off some more, and re-machined.

"Make or Buy" a boondoggle?

Major aircraft primes are casting a jaundiced eye toward the Air Force's "Make or Buy" directive, now about to be adopted by the other Services. (In essence, the directive limits the amount of ordinarily subcontracted work a prime can pull back into his own shop).

Feeling among the primes is that they already have their own "Make or Buy" policies and they are in line with what the military requires.

The primes don't think any directive is going to change current methods of determining what work should be kept in the prime's shop and what is to be subcontracted. That's because the determining factors in any such arrangement are economy and efficiency, which automatically insure equitable distribution of work between the prime contractor and the subs.

But the primes are trying to be objective about the whole setup. A spokesman for one views the Make or Buy directives as unnecessary, but has no quarrel with "an obvious attempt to share the wealth with smaller firms." The government's purpose, of course, is to reestablish the broad base mobilization concept of WW II.

But there are some basic misconceptions underlying the whole idea, he claims. For one thing it is almost impossible to spell out what should be bought and what should be made.

Not only that, he claims, it is unrealistic to expect companies to let out jobs that they can do very well in their own shops.

An official of another aircraft and missile firm says his company already has an equitable make or buy system of its own but "the Air Force is our customer so we'll have to go along."

Subs all for it, though...

Whereas none of the big primes feel that military directives on subcontracting are really necessary, the subs are all for them. Their feeling is that while Make or Buy is no cure-all, it's at least a step to keep the small sub alive.

"If we had to depend entirely on the subcontract work we get from the primes," an official of a medium-sized company said recently, "We would be unable to support ourselves." As a result, this manufacturer has been pursuing direct contracts from the government—a practice that is spreading to other medium and small firms which formerly depended upon primes for work.

E M Armstrong, VP of Coleman Engineering, Torrance, Calif, notes an increasing tendency among primes to pull in work—to the point where "some sort of rules have become necessary to force them to let out some of the work."

Coleman particularly cites manufacture of ground-support equipment. "A few years ago, almost all ground-support equipment was engineered and manufactured by subs. Today, less than 10% of this work is let out."

So, although there is a marked contrast in attitudes toward Make or Buy between primes and subs, there is one attitude they share in common: both are frankly puzzled. Just how does the military expect to enforce it?

$500,000 radial former...

Most expensive single piece of equipment ever bought by Convair—a $500,000 Cyril Bath radial draw former—is about to make the trip to California on four freight cars.

The 92-ft-long machine weighs more than 100 tons, will stretch as much as 50 tons, as little as 2 tons. It'll be used to form stainless steel skin sections for Atlas missiles.

Beat production quotas and costs with:

Cushman air operated

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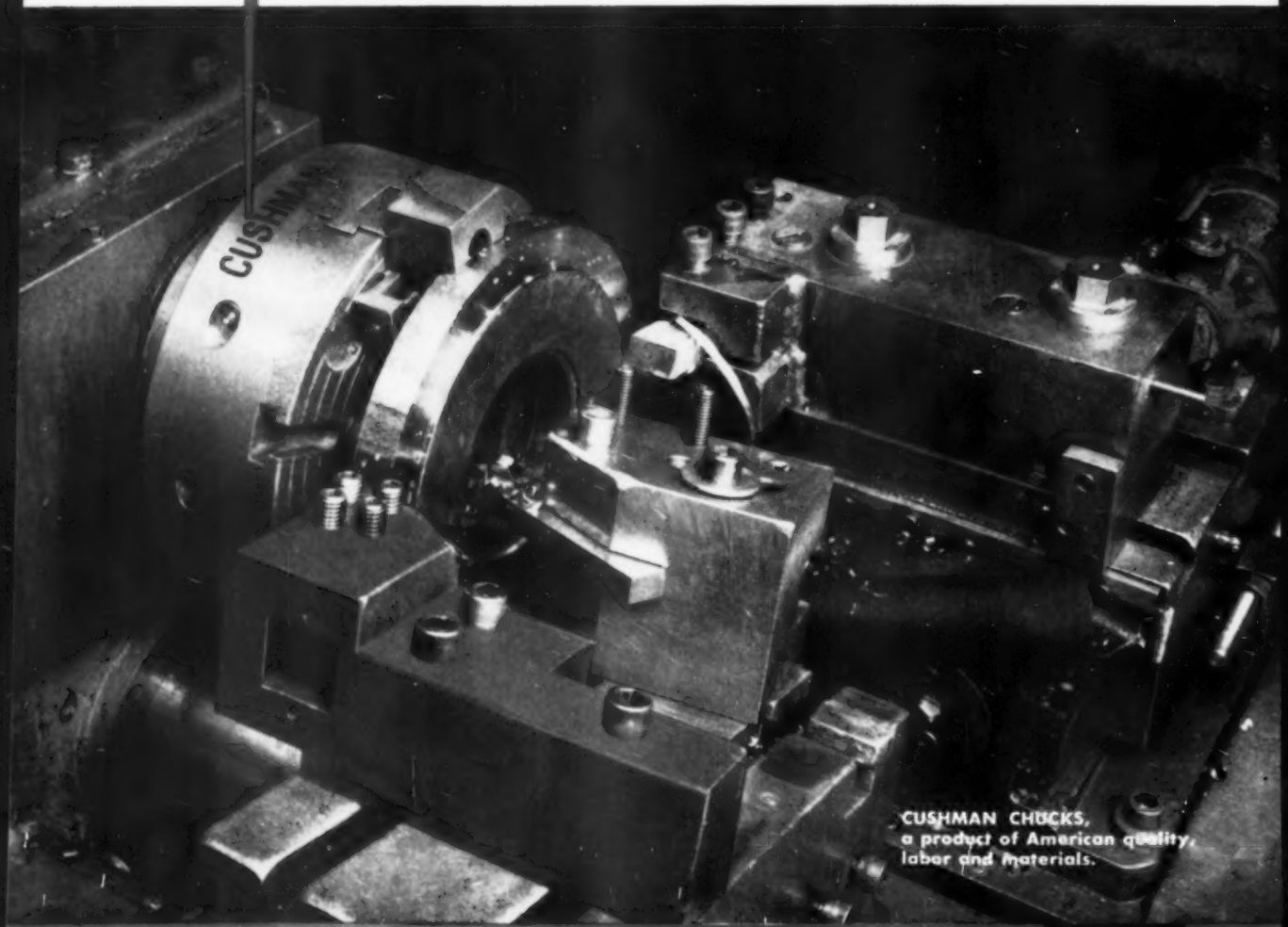
Cushman, the leading manufacturer of air operated chucking equipment, has designed and built a complete line of air operated chucks, cylinders and accessory equipment engineered to meet modern machine tool requirements of heavier feeds at higher speeds, maintain repetitive precision accuracy and positive gripping with truly fast workpiece chucking and unchucking.

Write today for your copy of Bulletin PO-65D and see how you, too, can effectively beat production quotas and lower machining costs by using efficient, economical Cushman Air Operated Chucking Equipment.



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MACHINE TOOLS...

Gain of 20% to 35% expected . . .

Many machine tool builders report new orders gaining slowly but surely. Estimates for 1959 now put the increased volume over 1958 at 20% to 35%, some companies being considerably more optimistic than others. Several makers of general-purpose metal-cutting machines have booked appreciably more orders in March than in February. Builders of presses also have been doing better.

No big program of any kind has given support to machine tool demand. Purchases have mostly been of single machines or small lots.

Representative of Mercedes-Benz has been in this country placing orders for machine tools for a Mercedes plant to be built in India. Export-Import Bank is doing the financing.

Detroit Transmission Division of General Motors is allotting orders for its new transmission line at a disappointingly slow rate.

Gould & Eberhardt-Asquith sign . . .

Gould & Eberhardt Inc, Irvington, N J, has concluded a licensing agreement with Asquith Machine Tool Corp Ltd whereby it will manufacture and sell in the United States Maxicut 2A and 3A gear shaping machines of Drummond Brothers Ltd, Asquith subsidiary. At first, Gould & Eberhardt will sell machines made at Drummond's British plant until production can get under way at Irvington. U S selling will be done through Gould & Eberhardt distributors throughout the country.

Gould & Eberhardt, in turn, has granted a license to Drummond Brothers to build certain sizes of Gould & Eberhardt gear hobbing machines in England.

These machines will be sold by Drummond-Asquith (Sales) Ltd, which has been appointed the sales distributor for all Gould & Eberhardt products in the United Kingdom and Eire.

Gould & Eberhardt already are building and selling in the United States the new Gould & Eberhardt-Delapena cold-heat gear-tooth induction hardening machine under license from Delapena & Son Ltd, Cheltenham, England.

Michigan Tool to sell Lorenz units . . .

Michigan Tool Co, Detroit, Mich, has reached an agreement with Maschinenfabrik Lorenz, Ettlingen, Germany, whereby Michigan will market the U S versions of some 14 models of Lorenz gear shapers and hobbers in this country under the name of Michigan Lorenz. The final details on the modifications of the machines for U S customers, which will be made either by Lorenz or Michigan, are now being worked out. Michigan Lorenz machines will be sold and serviced through Michigan Tool Co's regular sales outlets.

Khrushchev orders from British . . .

Prime Minister Khrushchev, visiting the Leipzig Fair in East Germany recently, placed orders "as a gesture of good will" for two British Wiedemann turret punch presses (made by Dowding & Doll), two Coventry Gage & Tool thread grinders and two 30-in. Newall optical rotary tables with automatic control. Total value is $100,000.

Representatives of these three British companies plus two other builders—Klingelnberg in West Germany and Dixi in Switzerland—met with Mr Khrushchev on his invitation after he had visited the collective exhibit of British machine tool builders. Mr Khrushchev said that Russia was prepared to import British tools "on a substantial scale" but a formal trade agreement was an essential prerequisite.

Russians are said to be interested in buying horizontal boring machines, automatic transfer machines, gear hobbers and heavy presses, as well as other specialized machines.

India given U S excess tools . . .

Indian government is reported to have accepted a gift of several thousand used machine tools from the United States. Most of the machines had been declared "excess" by the armed services and have become available over a period of many months. Total value: about $14 million.

These machines, many of which have been "reconditioned" and not rebuilt, consist mostly of lathes.

Around 1500 lathes have been allotted to the railways of India. Small-scale and medium-size industrial plants are to get the remainder.

Cleveland Twist Drill buys Bay State

Bay State Tap and Die Co, Mansfield, Mass, has become a subsidiary of the Cleveland Twist Drill Co, Cleveland. Operations of Bay State will continue in Mansfield under the direction of Louis A Lincoln who has been president for 22 years.

BF

260 ways to "package" a pinch of powder

Metallurgical Products Department reports on a line of 260 locally-stocked Carboloy® cemented carbide inserts that slashes inventory and special-order costs

Carboloy cemented carbides start as metal powders – end as man-made metals in a variety of disposable inserts *unmatched* in the industry.

And that's where you save with Carboloy cemented carbides. You choose from 260 different inserts – 11 styles – 7 cutting grades – in any size, thickness, radius, or shape you need. You get an insert that's almost tailor-made for your particular job without costly special-ordering; and you get it *fast*, from a *local* distributor who carries your inventory *for you*.

All Carboloy cutting tools are stocked by your local Authorized Carboloy Distributor. Call him (see the Yellow Pages, under "Carbides"); or write: *Metallurgical Products Department of General Electric Company, 11149 E. 8 Mile Road, Detroit 32, Michigan.*

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MATERIALS... TRENDS

Alloy prospect bright...

Iron - Aluminum - Manganese alloys combine lightness, cold workability, high-temperature strength and oxidation resistance, according to the Navy and National Research Corp. As described in Armour Research Foundation's *Industrial Research Newsletter*, this new family of steels is austenitic; is 15% lighter than 18-8 stainless steel and up to 25% lighter than cobalt and nickel superalloys.

Tensile strength of the new alloy group is expected to approach 250,000 psi; oxidation resistance at 1500 F is 0.0065 in. after 100 hr; machinability is about equal to that of 304 stainless steel.

Tailored lubricants...

Discovery of a new way to extend knowledge of lubricating-oil molecular composition, by Gulf Oil Corp scientists, may make possible closer formulation of lubricants for special purposes, by arrangement of molecules. Relationship of oil molecules to performance, interpreted by a new mass-spectrometer technique, is the key. Qualities determined by molecular composition include viscosity, pour point and resistance to oxidation.

Need for knowledge about molecular composition results from increasingly severe demands made on lubricants by today's technology, including tremendous pressures, heats up to 600 F and higher, and extremely close tolerances and fits in rockets, aircraft, and new industrial processes. Rule-of-thumb formulation isn't enough to meet precise engineering specifications.

Focus ultraviolet...

Called Ultrascope by its developer, Radio Corporation of America, a new electron tube is said to permit direct visual focusing of an image under ultraviolet light. As the "eye" of a microscope attachment which converts invisible images into visible pictures, the electron tube is a modification of the Army's Snooperscope (which converts infra-red wavelengths to visible light).

Developed, primarily, to broaden knowledge of cancer, arteriosclerosis, and virus infections, the new device has major industrial significance for inspection of metal surfaces treated with penetrant which emits ultra-violet radiation. Images can be electronically amplified for clearer evaluation.

Corrugated paneling...

Developed by Republic Aviation Corp, a panel formed by sandwiching corrugated metal between sheets of high-temperature-resistant metals, such as stainless steel or Inconel-X, is lightweight and able to withstand 2000 F while under pressure. Maximum sheet size is 16 sq ft. Panels are said to be suitable for speeds to Mach 9 without danger of melting.

New steels cold-form well...

To make its nuclear steels effective as a shield material for use against both gamma radiation and the radiation caused by the reaction of thermal neutrons with manganese and cobalt, the Jones & Laughlin Steel Corp has developed a new series of alloys.

With the manganese and cobalt at an extremely low point in these "nuclear steels," other elements such as titanium are added, when needed, to provide the best combination of nuclear and mechanical properties.

These new steels, in addition to their value for nuclear uses, have formability, weldability, strength, and excellent cold-forming characteristics. These qualities make the steels desirable for many non-nuclear applications such as cold-extruded shapes, cold heading, electronic parts, and for use in aircraft and missiles.

Casting cores from chips...

Cores made from metal chips are successfully used in Australia to produce complicated aluminum-alloy die castings. Chips from metal filing and bandsawing operations are graded by particle-size distribution similar to that for a normal molding sand. Graded chips are molded by conventional methods, mixed with bentonite and core oil.

Measurements of solidification rates of aluminum-alloy castings show the rate of heat extraction by cores made from aluminum chips and brass chips, respectively, to be 25% and 35% greater than the rate obtained with silica-sand cores. This method has proved simpler, more efficient and considerably less expensive than either solid-metal cores or quantities of small metal chills.

Metal cores have the disadvantage of having to be withdrawn from the casting, especially when the casting is complex. Small metal chills are good but too many are needed in large, complex castings.

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Typical parts produced by 2½" Model AW Cleveland, at profitable production rates, with simple tooling. Ask your CLEVELAND representative to submit a cost analysis with production estimates on your work.

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with the low-cost CLEVELAND 2½" model AW single spindle automatic

With a base price of $4000 to $5000 *less* than other comparable automatics, this Model AW Cleveland will set an unbeatable production pace in your shop. Not only is it fast, precise and highly versatile, it is a rugged, *fool-proof* automatic, free from complicated mechanisms and controls that require constant adjustment and maintenance.

Quick and easy to set up, this Cleveland features universal camming — rapid, hand crank stock feed adjustment—quick change collet pads—four automatic spindle speeds for each set of pick-off gears. An easily accessible tooling area is provided by wide, independent double cross slides and large diameter 5-hole turret. Forty spindle speeds —69 to 1920 rpm—give you efficient speeds for all types of materials and tools. Forward and return turret tool feeds are infinitely variable through a simplified mechanical drive.

With the 2½" Model AW Cleveland, you can *cut your costs three ways:*—ON BASE PRICE—ON SET-UP TIME—ON MAINTENANCE. For detailed machine specifications, write for AW Bulletin.

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WHAT'S AHEAD... in Metalworking

TRENDS

Capital goods orders slowly gaining...

Production of metal goods is continuing to expand slowly but steadily from the relatively high level where it has been since the first of the year. **Best news of all** is the improved order volume and outlook for industrial machinery. The McGraw-Hill Index of New Orders for Machinery has risen 15%, the latest figure registering an all-time high for the month. Four of the six components comprising this index, including pumps and compressors and metalworking machinery, show an upturn.

The forecast for industrial machinery orders is for a growing volume in the second and third quarters. The gains will be healthy if not spectacular. This means that as the year goes on, manufacture of capital goods will increase.

Output in the latter half should be better than in the first half.

General metalworking job shops, which have had their ups and downs over the last few weeks while most industries were coming out of the recession, now report a fairly general pickup. **Plating shops,** which experienced good business around the beginning of the year, now say business is on a plateau—but the plateau is 20-25% above corresponding 1958 levels.

Stamping shops by now are pretty well agreed that business is on the upturn, but they also agree that the pickup is still not enough to increase backlogs to any great degree.

But by 1959's end, stampers think the year's business will have chalked up totals 25 to 50% above comparable 1958. Orders are increasing from the electronics, appliance and home-building fields.

Mill supply houses, a fairly good bellwether of all-metalworking conditions, say business is up anywhere from 10% to 37% over last year.

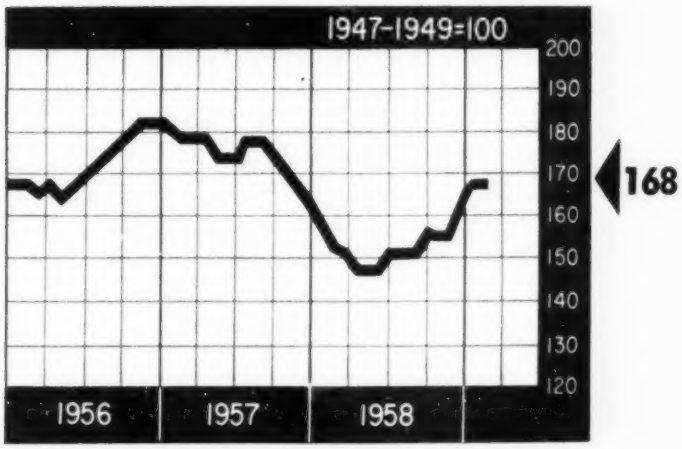
The market today is particularly strong for braces, cutting tools and fasteners. Cutting tools "are about the only thing in short supply at the moment," one supplier says. He is confident the upswing will continue through the first half but thinks that a prolonged steel strike could upset the applecart.

On the consumer durables manufacturing side, appliance production and sales continue to soar. One big Midwest manufacturer is adding 700 workers and a second shift to its refrigerator plant, predicts a 40% increase for first half 1959 over second half 1958. Refrigerators and freezers are heavily backlogged.

Farm machinery sales and production, too, are continuing at high levels after a long period of depression. International Harvester, for example, suffering from a nine-week strike, has the highest order backlog for all its products in recent years.

Farm machinery makers are adding large numbers of workers and new shifts, are taking back many people laid off during prolonged bad times. Companies report first quarter sales running something like 50% ahead of comparable 1958, and with the advent of warm weather, spring plowing and planting, business should stay on the upswing for several months.

Makers of railway equipment report that their outlook is brightening, although a pickup has been a long time coming and still isn't anything "to shout about."



AMERICAN MACHINIST INDEX OF METALWORKING PRODUCTION

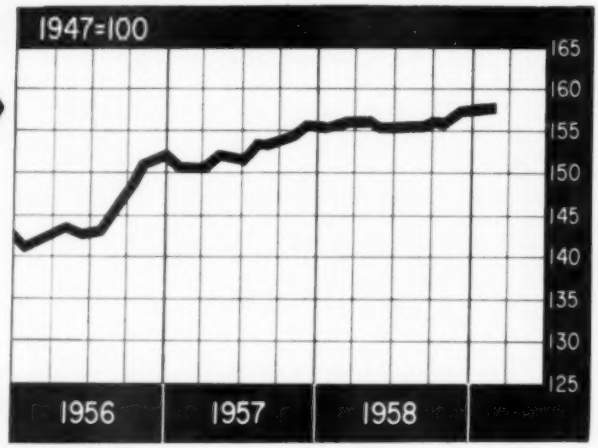
BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

	FEB Estimated	JAN Preliminary	DEC Revised	JAN Year Ago
Total Index	**168**	**167**	**165**	**159**
Machinery	**134**	**132**	**132**	
Electrical Machinery	**200**	**190**	**192**	
Autos	**135**	**141**	**120**	
Other Transportation	**330**	**314**	**318**	
Other Metalworking	**144**	**143**	**135**	

TRENDS WHAT'S AHEAD... in Business

AMERICAN MACHINIST INDEX OF METALWORKING PRICES

	FEB Estimated	JAN Preliminary	DEC Revised	JAN Year Ago
Total Index	**158.4**	**158.2**	**157.9**	**156.2**
Metalworking Machinery	**182.4**	**182.2**	**183.0**	
Other Machinery exc. Electrical	**169.5**	**168.8**	**166.6**	
Electrical Machinery	**158.8**	**158.6**	**157.2**	
Fabricated Metal Products	**148.6**	**148.4**	**146.8**	



Steel strike reactions forecast good business . . .

Several months of continued improvement in business can be expected. The business recovery will continue. Industry's reaction to the threat of a steel strike has resolved any doubts that business will be rising through the spring and on into the summer.

But more and more the indications are that it will be moving up somewhat faster in the spring than it will later in the year.

The steel industry accounts for less than 2% of our total employment and only about 5% of the Index of Production of the Federal Reserve Board. Yet the labor negotiations in the steel industry, which threaten to end in a lengthy strike after the present contract expires, are widely regarded as a decisive event for the entire U.S. economy—for the rest of 1959 and beyond.

As the steel industry's customers view it, these labor negotiations are decisive. The wage increase of a billion dollars sought by McDonald of the Steelworkers union is enough, they believe, to assure either a strike or a substantial price increase or both. They are going ahead to build up their inventories of steel as a hedge against the possibility of no steel at all or merely against more expensive steel.

Proof of this trend is demonstrated by the current rate of operations of the steel industry. At present the operating rate is running over 90%, compared with a rate of 74% in January.

The essence of the figures on new orders, production and consumption of steel is that by the June 30 contract expiration date, stocks of steel will be six to seven million tons higher than at the beginning of the year.

The production schedule for steel over the next three months, together with what this means to all suppliers to the steel industry, will give the economy as a whole a firm nudge upwards. It will be doing so at a time when business is already on a sustained rising curve.

The main hopes for a new burst of strength in the fall, after the steel situation is settled, lie in two places—consumer durables (especially autos) and business capital spending. The latter sector of the economy seems to be registering a marked pick-up now.

WEEKLY BUSINESS INDICATORS

	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1947-49=100)*	153.1	153.4	125.5
Steel ingot production (thousand tons)	2,600	2,556	1,463
Electric power output (million Kilowatt hours)	12,945	12,972	11,793
Production of automobiles and trucks	166,316	162,728	108,322
Engineering construction awards (Eng. News-Record, millions)	$372.1	$523.1	$313.1

MONTHLY BUSINESS INDICATORS

	Latest Month	Preceding Month	Year Ago
Refrigerators sales (thousands of units)	287	246	215
Vacuum cleaners sales (thousands of units)	370	294	238
Washers sales (thousands of units)	331	333	207
Household electric ranges sales (thousands of units)	84	74	77
Radio production (thousands of units)	1,526	1,546	1,793
Television production (thousands of units)	415	438	574
Gear sales index (1947-49=100)	145.5	182.7	150.8
Foundry equipment new orders index (shipments, 1947-49=100)	137.0	83.3	61.4

* Seasonally adjusted

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R. Hoe & Co. Inc., New York world renowned manufacturers of printing presses, has actually accomplished this in the machining of their impression cylinders.

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The all-hydraulic tracing unit in combination with the accuracy and rigidity inherent in "AMERICAN" lathes insures the highest quality of work both from the standpoint of accuracy and fine finish.

With production costs constantly reaching new peaks, industry simply can't afford to ignore such savings from modern equipment. Where else could such a magnificent return upon an investment be secured, and how else can costs be lowered to meet an increasingly competitive market?

More production per man hour is the answer and the only answer to spiraling costs—modern, high production machinery is the answer to greater production per man hour.

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American Machinist
MAGAZINE OF METALWORKING PRODUCTION • ESTABLISHED 1877

A Prime Object of Management

The 1958 recession has one good deed to its credit. It has made metalworking management cost-conscious.

Not to say that management has not kept a weather eye on costs all along. But shrinkage in volume and in profits put the spotlight relentlessly in costs.

Management usually, under such circumstances, ferrets out quickly for its attention a few choice extravagances. It often seems to overlook, however, a lucrative area—materials handling. And this is an area that in the past has bred many extravagances.

The moving of parts, materials and finished products from one point to another within the shop, as efficiently as possible, should be a prime objective so as to see that materials are at the right place at the right time, and on time. They also should be there in the right quantities.

If that is done, in a smooth flow, the utilization of shop space is simplified. A minimum of space is required. And the materials handling system itself can be used as a sort of mobile stock room.

Some experts have estimated . . .

that materials handling accounts for 35% of all production costs. Whether it is that much or not, it is relatively high and is an area which provides rich rewards for intelligent effort and a reasonable expenditure of money and time.

Bear in mind a few basic principles. Each time a piece of work is handled in the shop, it costs money. Productive workers are paid to produce. Every bit of time they spend lifting or moving materials is a minute lost to production.

Inadequate or erratic flow of work to machines slows them down or stops them. The cost of machine down-time is high, based on lost productivity. If an entire production line is involved, as it sometimes is, the loss is not only shocking, it is unnecessary.

Remember also that large inventories tie up a lot of capital. They need storage facilities. The more efficient your materials handling system, the smaller the inventory that you must carry.

Don't overlook . . .

the very important savings to be derived from feeding work by mechanical means into and out of your machines. This kind of materials handling will enable you to get more production out of your machines, and at a uniform rate (machines don't need coffee breaks).

Then there is the matter of improved working conditions. Mechanical power is substituted for human muscles in moving and lifting materials. Employees have less physical tasks to perform and can be upgraded to productive work. When employees are comfortable in their jobs, their spirits are higher and their productivity goes up.

Altogether, the benefits of moving material in your shop by the best possible mechanical means are large. Perhaps most satisfying of all, they will contribute handsomely to pulling down your manufacturing costs and to adding to your profits.

Burnham Finney EDITOR

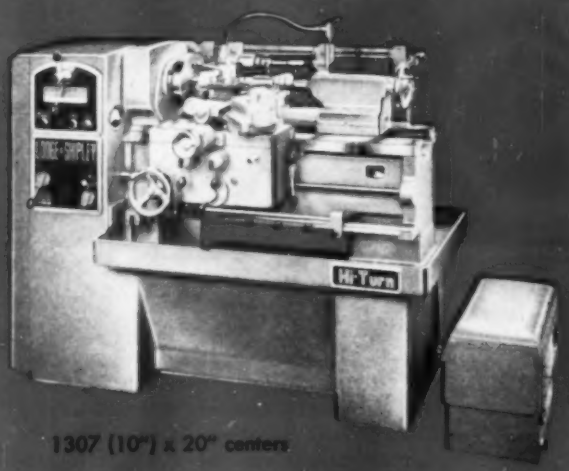
LITTLE LATHE

Big Producer

LODGE & SHIPLEY

Hi-Turn

COPYMATIC



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The 10" HI-TURN 45° COPYMATIC is extremely rugged, built to do production jobs at time and money-saving rates. With all the features noted, plus traditionally high Lodge & Shipley standards of quality . . . the price is still substantially below many lathes having fewer features, less horsepower and light construction. If you perform manufacturing or tracer lathe operations, you probably have comparatively small jobs running on big, costly lathes. A HI-TURN does both types of operations . . . gives you productive capacity matched to the job for low costs. For complete details, request Bulletin HL-105.

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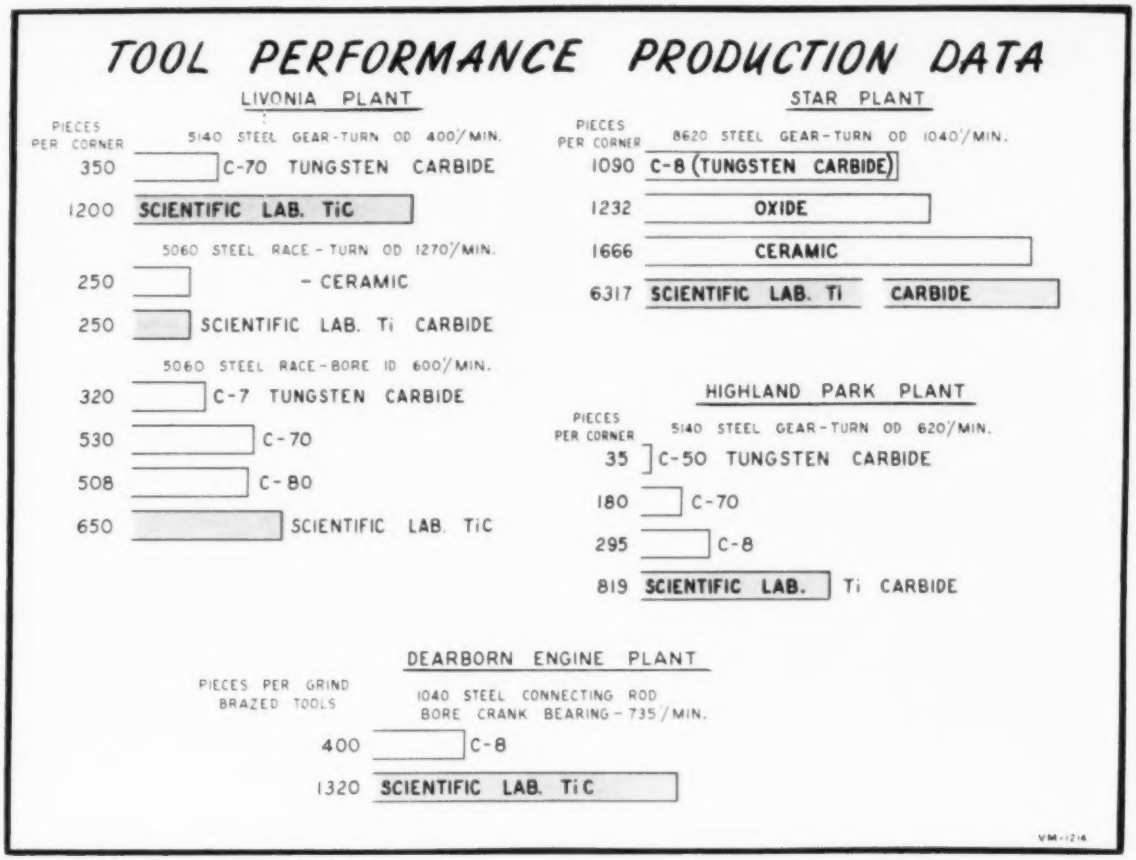
1...All-hydraulic 45° tracer control
2...Template-type multiple length stops
3...9 forward and reverse speeds, up to 3000 rpm
4...All-spur gear, anti-friction bearing headstock
5...Full 5 hp Dinabrake motor, leg-mounted and wired
6...Totally-enclosed, 9-feed quick change gear box
7...Reversing drive for cross-center facing
8...Automatic lubrication throughout
9...Uses round or flat templates
10...Direct-reading diameter and length dials
11...Rapid traverse "in" and "out"
12...Reservoir pan, coolant pump and piping
13...Oil-tight "start, stop, reverse" buttons
14...Built-in horsepower ammeter
15...Hardened, ground tailstock spindle with tang driver
16...Hardened and ground bedways and crossways

Lodge & Shipley

. . . your Lodge-ical choice



Tool life comparison . . . between Ford's new titanium carbide material and such other tool materials as ceramics and tungsten carbide is shown in this chart taken from experimental data at Ford's Livonia, Star, Highland Park, and Dearborn Engine Plants. Titanium carbide won out in five of six tests, tied the other

New TITANIUM CARBIDE TOOLS outlast ceramics

Titanium carbide will outlast tungsten carbide, ceramics (up to certain speeds) and other cutting tool materials by wide margins. That's the claim of its developer, Ford Motor Co—and Ford has tool life data to back up its claims.

The new tool material was created in answer to this question, "If other cermet systems (tungsten-carbide-cobalt for instance) can be processed to retain the best properties of ceramics and metals, why can't the same thing be done with a titanium-carbide system?"

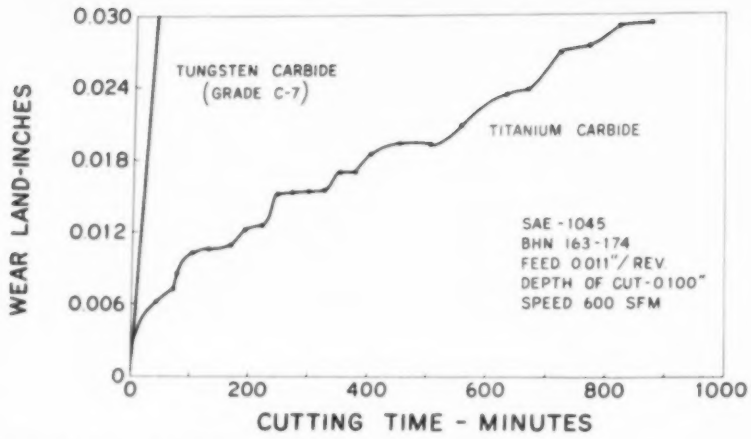
The inherently higher hardness of titanium carbide (3200 kg/mm²) as compared to tungsten carbide (2400 kg/mm²), superior oxidation resistance and greater resistance to welding with metals offered potential advantages over tungsten carbide. The low weldability had been recognized by the carbide industry since the addition of titanium carbide to tungsten carbide improved cratering resistance and provided steel cutting tungsten carbide grades.

Another vitally important advantage is a strategic one. Titanium (unlike the tungsten in most cutting tools) is readily available within the borders of the United States. Although metal-bonded titanium carbide has been under extensive development for over a decade, primarily as a cermet for high temperature structural applications, most work has resulted in relatively coarse grain structures—unlike the widely used tungsten-carbide grades.

The Ford material is a dense fine-grain structure with a nominal particle size of two to four microns after sintering. Hardness can be varied over a wide range but runs 92 to 93 Rockwell A for the steel cutting grade, now fully developed.

For cutting steels, a 10% nickel, 10% moly, 80% titanium carbide material has been applied to mechanically clamped throw-away and brazed inserts. Ford is also investigating the possibility of other grades for cutting a variety of metals (including cast iron) and for rough machining, as well as for making interrupted cuts.

The nickel-moly-titanium carbide grade for steel has not only been tested exhaustively in the laboratory but also on production lines at various Ford plants. In one of these the



Standard machinability test . . .

. . . which pitted Ford's new titanium carbide bit against a standard C-7 tungsten-carbide tool bit, showed that the tungsten carbide bit cut approximately 85 lb of metal and lasted just 37 minutes before attaining a land wear of 0.030 in. Ford's titanium carbide bit cut more than 2000 lb of metal, lasted 890 minutes under the same conditions

operation called for turning the OD of an 8620 forged steel gear blank. BHN was 170 to 207 and the job was done at 1040 sfm with a feed of 0.013-ipr and a depth of cut of 0.010-in. Comparisons were made among throw-away inserts made of C-8 tungsten carbide, two grades of oxides, and the nickel-moly-titanium carbide material. The latter produced 6317 pieces per corner while the tungsten carbide made only 1090. One grade of ceramic produced 1232 pieces per corner and the other, 1666.

In another application, C-70 tungsten carbide inserts were compared with the new material for semi-finish turning the OD of a forged 5140 steel gear blank with a BHN of 179 to 217. Speed was 400 sfm, feed, 0.017-ipr and depth of cut 0.015-in. The nickel-moly-titanium carbide inserts produced 1200 pieces per corner compared with 300 for the tungsten carbide inserts.

Semi-finish boring 5060 steel tubing with a BHN of 269 to 311 also indicated superior qualities in the nickel-moly-titanium carbide material. Here the speed was 600 sfm, and feed was 0.012-ipr, and the depth of cut 0.015-in. Three different grades of tungsten carbide produced 320, 508 and 530 pieces per corner as compared with 650 for the titanium carbide inserts. Even greater differences were shown in semi-finish boring 1045 steel forgings at 735 sfm. BHN of this material was 229 to 262. Feed was 0.010-ipr and the depth of cut, 0.015-in. Brazed inserts were used on this job with the titanium carbide material running 1320 pieces per corner as compared with only 400 for C-8 tungsten carbide.

On machines running at high speeds, around 2000 sfm, it is expected that the new material will not have as long a life as ceramic tools. However, raw material cost is comparable with cobalt tungsten carbide and processing requires no special techniques. As in conventional practice, mixture of titanium carbide, with nickel and molybdenum as the binder are briquetted at 20,000 to 40,000 psi. Density is achieved with liquid phase sintering at about 2500 F in a vacuum, or in helium, hydrogen, or any inert atmosphere.

The main concern is to mix fine particle size materials and after sintering end up with a fine grain structure. Ford metallurgists point out that reasonable processing controls provide good results. According to Dr Michael Humenik, Jr, supervisor of Ford's Ceramics and Powder Metallurgy Group, improved wettability of the nickel-titanium carbide system by the addition of molybdenum promotes dispersion of the carbide phase. By controlling wettability, (a function of sintering temperature, time, atmosphere, binder, etc), grain structure is controlled, too.

According to E D Marande, manager of metallurgy at the laboratory, pilot plant equipment has been installed to produce cutting tools for use within the company and also to determine actual manufacturing costs. As was done with its extruded turbine wheel development, (AM May 5 '58) Ford may consider licensing agreements for this process, too.

Convair

High-energy forming (specifically, Convair's less-than-a-year-old Dynapak machine tool) is now producing extrusions from such hard-to-move metals as tungsten, columbium, zirconium, steel-jacketed sintered nickel and titanium. And it's making extrusions and forgings to closer tolerances and with greater savings in materials than is possible by conventional methods.

That's the essence of a progress report on Dynapak made by Convair's supervisor of producibility, S R Carpenter, at the 11th Western Metal Exposition last week in Los Angeles.

Extensive tests at Convair have produced two conclusions that are milestones in the science of working metals, Carpenter said:

- "Metals behave hydrodynamically under forces produced by high energy rates" (Rough translation: If you pound it hard enough and fast enough, metal will squirt and otherwise behave like liquid).
- "Hydrodynamic flow equations can be used to predict the required velocity to make a given part."

Metals begin to behave like liquid at pressures of 200,000 to 300,000 psi. Corresponding velocities through the extruding die run to 9000 inches per second. The orifice coefficient (such as appears in equations for hydraulic flow of liquids) seems to apply to the flow of some metals through extrusion dies, Carpenter said. And under these hydrodynamic conditions, the material completely and easily fills the die in adjacent thin and thick sections.

Steel extrusions produced by hydrodynamic flow during Convair's experiments with Dynapak featured these noteworthy developments:

- Unsymmetrical sections.
- Sharp definition of section and complete die filling.
- A high ratio of thick to thin section. Tests to date show that ratios of 20 are easily attainable with a minimum thickness of 0.035 in., and there is every indication that such ratios are far from the upper limit attainable with Dynapak.
- Abrupt changes in section.
- Hollow sections with internal and external fins, some of which have been extruded to 0.010 in. thickness.

Such shapes are by no means limited to steel, Carpenter said. Con-

reports on HIGH-ENERGY FORMING

vair has achieved some notable developments in the extrusion of tungsten, columbium, sintered nickel alloy, powdered nickel alloy, zirconium and titanium. Alloys of the latter metal have also been extruded as an "H" section in Ti 6A1-4V, Ti 5A1-2.5Sn and Ti 13V-11Cr-3A1 (all beta).

Metal behaves like liquid in Dynapak forging as well as in extruding, Carpenter said. Two steel forgings were produced, unusual in that they have essentially zero draft angle. Especially noteworthy are the abrupt changes in section with minimum corner radii—considering that a part is made with one shot of the machine.

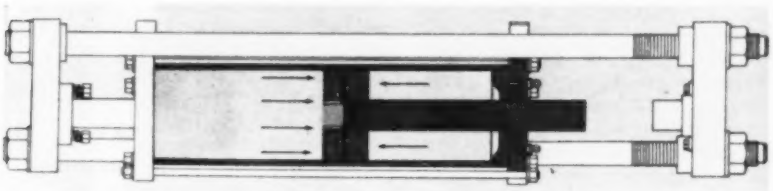
This, said Carpenter, opens up new horizons in forging, may even lead to long-sought-after low-cost precision forgings.

High energy rates have also been applied at Convair to forming sheet metal, although this work isn't as far along as that for extrusions and forgings. Some findings so far:

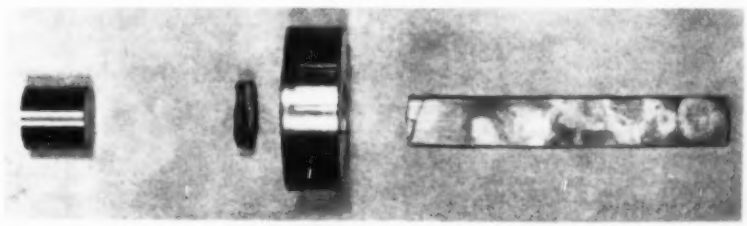
- Curved flanges can be formed over a given radius approximately 50% wider than is possible by such other methods as drop hammer and hydropress.
- Precise control of high energy rates insures exact duplication of results.
- High energy rate forming is safe to use inside a plant. There is no need for off-site forming.

What about overall savings of high energy extrusion over conventional methods? Convair cites this example: An extrusion with an 0.05-in. minimum wall thickness if produced by conventional methods would require a 50% material loss in subsequent machining. Convair's Dynapak method can extrude such a section to size, with no loss at all in material. The company figures that material cost savings alone run from $30 (for air-melted steel) to $6500 (for beryllium) per 100 lb of finished extrusions.

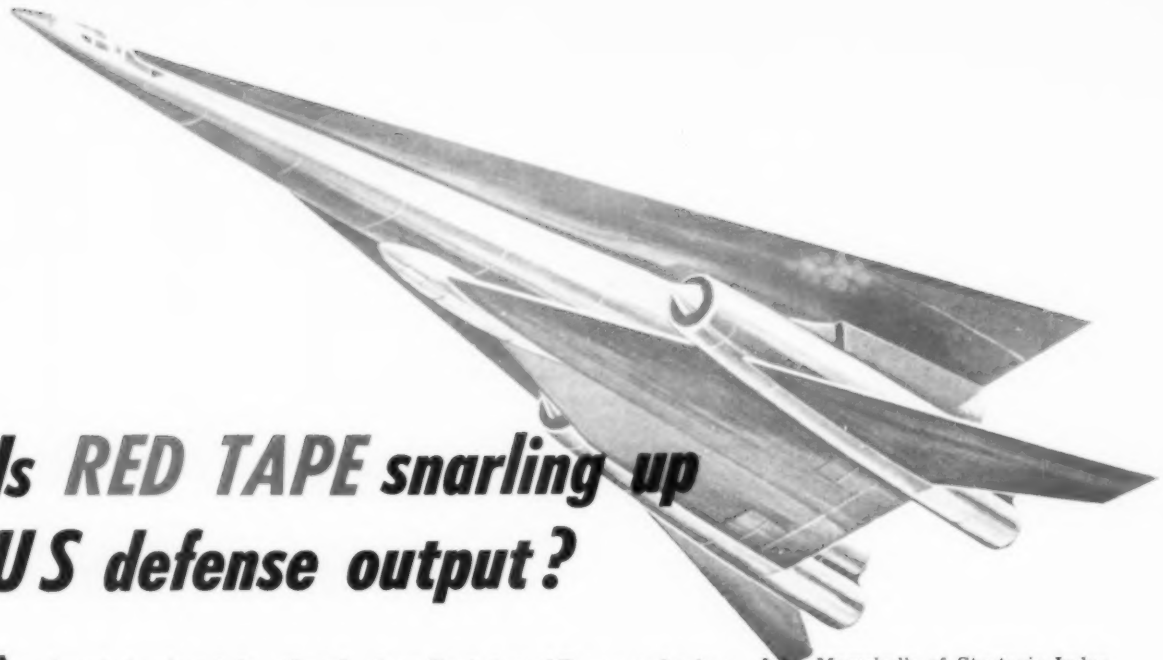
Forging material savings are even more impressive, Carpenter claims—amounting to anywhere from $335 (for air-melted steel) to $42,500 (for beryllium) per 100 lb of material. But this doesn't take into account the scrap value of chips, or differences in various types of machining.



Here's how Convair's Dynapak machine works . . .
Actuating device is a cylinder separated into two chambers by an orifice plate. In chamber (left) high-pressure gas is stored. Relatively low gas pressure in chamber at right forces the piston against the orifice plate, and a seal in the piston face isolates all of the piston surface area (except a small area surrounded by the seal) from the high-pressure gas. Machine is now ready to "fire." Application of slight additional pressure to the high-pressure chamber at left starts the piston moving, allowing the high-pressure gas to push against the entire piston face. The tremendous pressure differential created provides the "explosive" driving force. (AM Nov 17/58 p239)



EXTRUDED CAST-ARC TUNGSTEN



Is RED TAPE snarling up US defense output?

Are America's wings being clipped by outmoded government procurement policies? The men who make aircraft and missiles think so . . . and so do the men in government itself.

The slow tempo of U S missile production came under spirited attack during the recent (March 5, 6 and 7) Western Space Age Conference in Los Angeles. Designed to bolster the Pacific Coast's share of the missile market, the Conference is fast becoming a forum for no-holds-barred attacks on government red tape.

California's Senator Clair Engle touched off the battle during the opening day's luncheon, when he sharply criticized the government's financial management of defense programs. **Prime contractors and subcontractors, he said, are often victims of fiscal policies that are based on budgetary considerations rather than on defense needs.**

Engle proposed that limitations on progress payments and carryovers of unpaid bills from one year to the next be minimized to avoid unnecessary financial strain on defense contractors.

Several other speakers were also sharply critical of the U S Ballistic Missile Program, blaming at least part of production foot-dragging on the Defense Dept's complicated administrative network. One speaker noted that "Ninety bases have to be touched for complete coordination of U S space activities—no wonder we are having trouble keeping up with the Soviets."

This year, the Conference brought together representatives of the Defense Dept, Armed Forces, and prime defense contractors to discuss the changing nature of the missile market. Speeches and panel discussions were focused on new problems confronting small and medium-sized defense firms.

Kickoff session of the Conference was a panel discussion of the changing relationship between prime and subcontractors. The directors of materiel of several prime contractors outlined implications of the weapons system concept for defense.

Carl Uhden of Convair Astronautics summed up this changing emphasis—"The relationship of the prime contractor and his subcontractor has changed from the supplying of vendor items designed to meet general military performance specifications to the designing and furnishing by subcontractors of many items to exacting special requirements and specifications laid down by the prime contractor."

Roulon Nagely, director of materiel for North American Aviation reassured small business firms, "Some questions have arisen over what part small business will have under the weapon system contractor method of procurement. Some fear has been expressed that small business will of necessity be squeezed out of defense work. I assure you that this fear is without foundation. Small business will participate as in the past. North American's subcontractors will continue to let out at least the same amount of work to small business as formerly."

However, another panel member, John Marschalk of Strategic Industries Association, charged that the government has failed to take full advantage of the special skills of small business:

"The startling fact is that there are economic penalties on prime contractors who engage too extensively in subcontracting. The rules of renegotiation provide for a lesser profit on subcontracted work than on work done in plant. And the standards of military buying require the maximum amount of direct labor (in-plant labor), if a prime is to reflect acceptable overhead rates.

"Thus while the right hand of the government urges more subcontracting, the left hand reaches into the pocket of the prime and takes away a little bit of profit every time."

Suggestions were offered as to how subcontractors could successfully adapt to the military's changing procurement pattern. F L Dobbins, Boeing's director of materiel, declared—"Of all the considerations which are taken into account in evaluating potential subcontractors, the one which is standing out under the weapon system concept is management capability. Since more systems and sub-systems are being subcontracted (contrasted to individual items in the past) the subcontractor will generally have system responsibility."

Dobbins continued, "With the rapid technological advances being made, and with competition being what it is, subcontractors who do not prepare themselves to take this kind of role may well rule themselves out of the picture."

The question-and-answer period which followed the discussion brought out a few notes of subcontractor dissatisfaction. Criticism included claims that the primes retain an excessive percentage of defense business, that primes are setting up more sole procurement sources, and that Western primes in some cases are favoring Eastern defense firms.

In reply, Roulon Nagely of North American Aviation maintained that historically primes have retained approximately half of defense contract business in their own shops and farmed out the remaining half. Something like 50% of this latter portion is routed to small business concerns, according to Nagely.

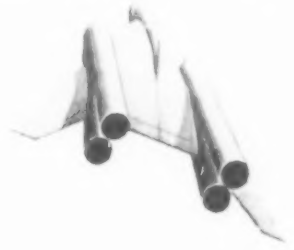
Barry Shillito of Hughes Aircraft pointed out that maybe it's the better-managed small businesses that are weathering the procurement changeover. Shillito noted that although the dollar volume of work that Hughes has subcontracted to small business is approximately the same as last year, Hughes now has one-third fewer subcontractors.

Shillito urged subs to capitalize on those areas in which they outperform the primes. These include greater flexibility, ability to deliver on time, competitive pricing and in many instances a better product.

The primes agreed that there is a trend toward single sourcing. They stated that multiple sources are necessary in the early design and development stages. But once a single source stands out, the prime has no alternative but to establish that sub as sole supplier. Generally, disasters and emergencies are too infrequent to be the sole justification for multiple sourcing, according to the panel.

Panel members denied that Eastern firms have received preferential treatment from Western primes. As a case in point, the Convair representative pointed out that 74% of the Atlas ICBM dollar has been spent in the West.

The favorite target of panel members was renegotiation. F L Dobbins of Boeing summed up the prime's attitude. Replying to a charge that primes had unfair access to government-furnished facilities, Dobbins declared, "Get rid of renegotiation. Give us a fair profit and we'll supply the needed facilities."



Several high-level representatives of the Armed Forces also participated in the Conference, outlining the military's development and production programs, and explaining how defense firms can participate in these efforts.

Major General William Thurman discussed the relatively new team bidding on Air Force contracts. Thurman pointed out that weapons systems and major subsystems are becoming so complex that in many instances individual companies will be unable to develop and produce them independently. He suggested that the aircraft industry consider ways of joining company skills so as to get the advantages of a team approach in making proposals, yet retain responsibility at a single point for weapon system management.

Team bidding gets nod

The Air Force encourages the team bidding concept for a number of reasons said Thurman. First, it helps avoid the creation of additional government facilities by utilizing contractors who already possess the required facilities. Also, it cuts down on the creation of duplicate engineering capabilities by bringing in firms which have the required technical competence. Finally, according to Thurman, it helps resolve the alleged tendency of air frame manufacturers to get into the components business.

Thurman said that the Air Force generally thinks of the team concept in terms of major systems—proposals that come before Air Force source selection boards. However, he stated that it also holds promise for small business.

Thurman added that a combination of small businesses can join together and take on a contract. If this method is used, there would not necessarily be any need for a large business concern to enter the picture.

Today, General Thurman said, this type of cooperation seems to relate best to the smaller items that the Air Force purchases—not to weapons systems or subsystems. As an example of small business bidding, Thurman cited a contract awarded to Hoffman Electronics, a small Los Angeles defense firm. Hoffman is the team manager of a group of eight defense firms working on a new airborne reconnaissance system.

Change small press dies in 15 seconds?

Die sets used in presses up to 60-tons capacity can now be interchanged in 15 to 30 seconds in some European plants. The system employs power-actuated clamps on the bolster and the ram to hold die assemblies at top and bottom. And it eliminates need for die setup men.

These facts were brought out at the Spring Technical Meeting of the Pressed Metal Institute in Chicago by Aldo L Coen of Alpha Products Inc and Stanley R Cope of the Acme School of Die Design Engineering. The new system, developed in Italy by an ex-Ford die engineer, makes it possible to produce stampings in lots of 1 to 5 pieces at little more unit cost than is achieved in making 100 parts at a time.

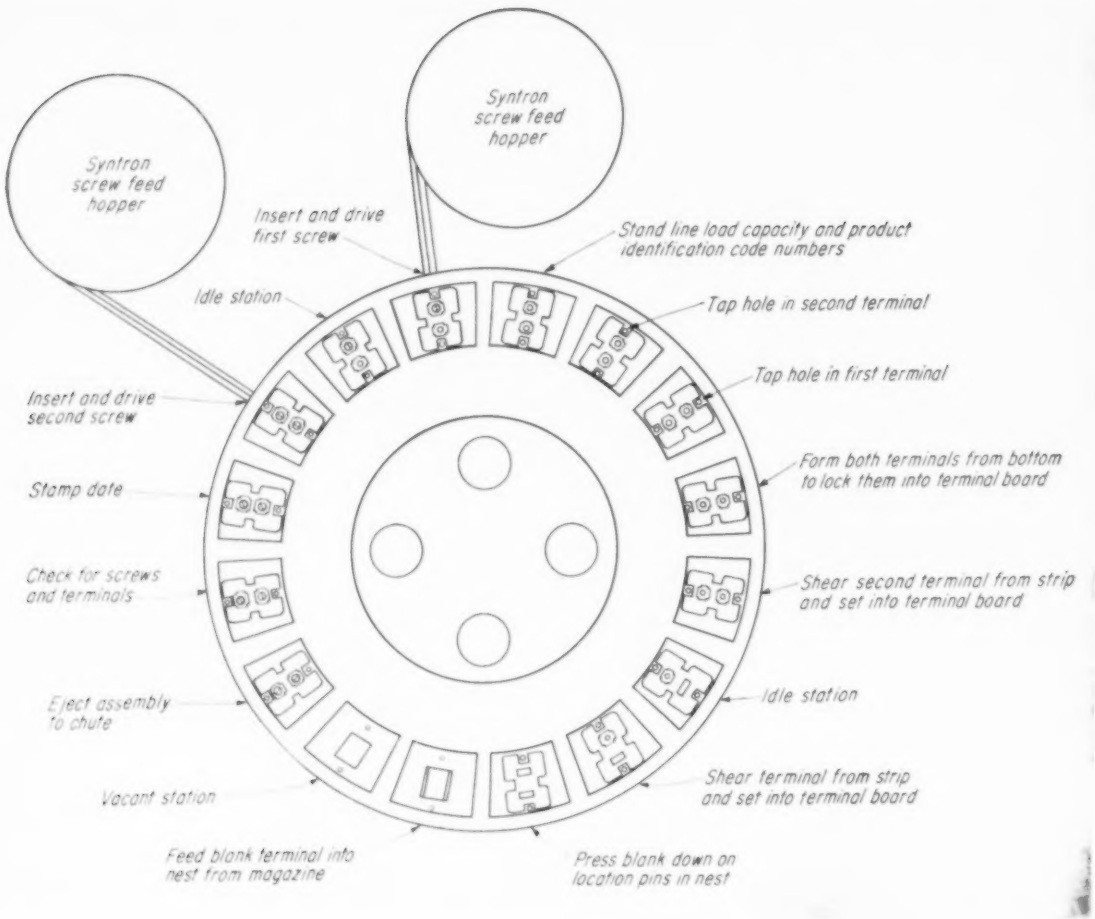
The system's die assemblies are similar to subpresses, are held open by springs. Die assemblies for a given press, or those used interchangeably in a line of adjacent presses, are set to a common height in the toolroom and tried out there, so that they are ready to make acceptable stampings when positioned in a press, where they are used with a fixed daylight opening and stroke, and are hand fed in almost every case.

In one Italian plant, visited by Mr Coen (who, incidentally toured France and Italy with Mr Cope and picked up information on the Italian die-changing method there), 100 bicycles are produced a day—and all of the 74 different stamped parts needed by the assembly line for a day's run are made on one press the day before.

The foreman lines up the dies on a roller conveyor at one side of the press, in the order that they will be used. The girl operator then uses the dies in succession to stamp the parts needed—quickly changing dies at the end of each lot and moving used dies to a second conveyor line at the other side of the press.

7 Minutes on Large Press

The Italian system (reportedly being licensed in Europe) is being used on a larger (500-ton straight side) press at one French plant, where it took just seven minutes from the last piece of one die to stamping the first piece from the succeeding die.


Syntron screw feed hopper
Syntron screw feed hopper
Insert and drive first screw
Stand line load capacity and product identification code numbers
Idle station
Tap hole in second terminal
Tap hole in first terminal
Insert and drive second screw
Form both terminals from bottom to lock them into terminal board
Stamp date
Shear second terminal from strip and set into terminal board
Check for screws and terminals
Idle station
Eject assembly to chute
Shear terminal from strip and set into terminal board
Vacant station
Feed blank terminal into nest from magazine
Press blank down on location pins in nest

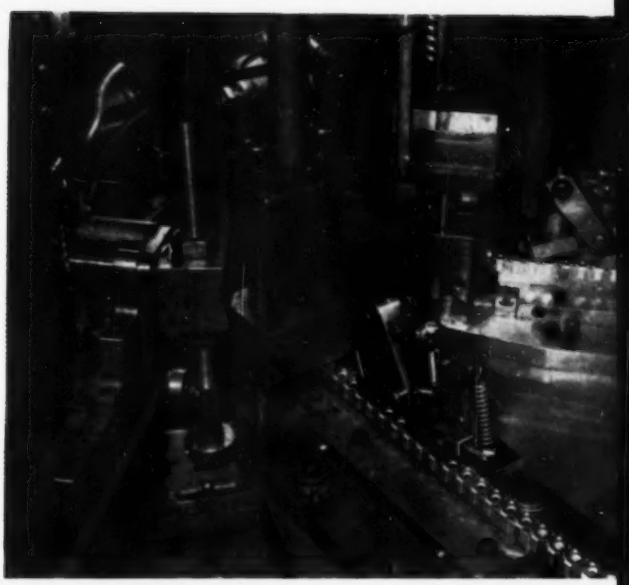
Retooling a dial machine for

Ingenious retooling of a Model 41-20 Bodine multi-station machine has taken assembly and inspection of transformer terminal blocks out of the slow, expensive kick-press-and-bench-operation class and into the realm of high-speed production at Minneapolis-Honeywell Regulator Co.

The Bodine was originally tooled to assemble part of a domestic thermostat, but now that M-H's machine research people have thoroughly retooled it, the unit is capable of assembling and inspecting more than 1500 two-position control transformer blocks an hour. And one operator now does the work of several men.

The operations the machine performs automatically (see drawing): mounting of two brass terminals successively in each magazine-fed

Loading terminal blocks . . .
Fiber terminal blocks in pan are manually loaded into the feed-magazine of the Bodine machine, which assembles brass screws and terminals automatically, then discharges finished units such as the two shown in operator's left hand



Feed, cutoff and insertion . . .
. . . of brass terminals is done one at a time at separate stations. At station beyond second terminal assembly station, both terminals are formed from the bottom so as to crimp them tight into place in the fiber plate

By Richard Mueller, machine research engineer
Minneapolis-Honeywell Regulator Co.

assembly and inspection

flat fiber block, tapping of terminals, assembly and driving of screws, inspection of assemblies to insure that terminals and screws are correctly placed, and ejection of accepted assemblies into a chute. Unacceptable terminal blocks (because of missing parts) are automatically ejected through another chute to a rework basket.

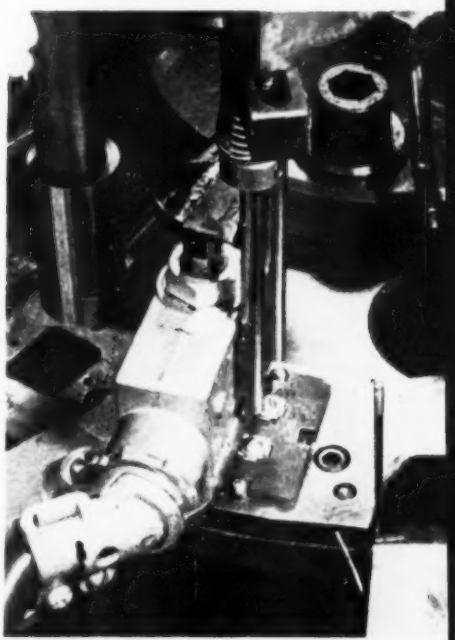
Terminals are blanked, pierced and formed from copper strips in 15-ton-capacity Kenco OBI presses, then fed in strips to the adjacent Bodine machine, where they are cut from the strips and inserted and crimped into the fiber blocks.

Idle stations are located between terminal and screw assembly stations to provide room for feeding devices and tools used at those stations. Separate spindles tap screw holes in the two terminals. Air blasts clean the tapped holes before terminal screws are inserted and driven.

Micro-Switch Controls

At each terminal assembly station is a precision Micro-Switch which, when actuated by a downward movement of the cutoff and crimping tools, closes to operate a solenoid-controlled, single-stroke clutch on the punchpress. In this way, a new terminal is added to the strip each time one is sheared from the other end.

Syntron vibratory hoppers and automatic drivers orient and assemble screws into each of the holes tapped in the brass terminals, while at other stations metal stamps stencil identifying code numbers, manufacturing and other data onto the fiber blocks.



Inspection station . . .
. . . where spring-loaded pins move vertically down onto completed terminal block assembly. If pin overtravel is not prevented, Micro-Switch above table moves a gate in a discharge chute at the next station to the right, directing the incomplete assembly to rework bucket

SIX MONTHS AGO . . .

. . . this was just about the outer limit of what you could do with tungsten fabrication. The x-ray targets shown here have relatively little deformation, tubing is formed from tin sheet, and the heating element is formed on a large radius

HOT FORMING tames the

Heat, heat and more heat is the secret of working that toughest of all metals—tungsten. With it, tungsten today is being forged, extruded, deep drawn and spun—methods that were considered impossible just six months or so ago.

Until six months ago, most tungsten parts were made by the powder metallurgy process, and it was practically impossible to work such parts except by machining. Too, mechanical properties of such alloys were dependent to a great degree upon the reliability of the bonding material. And melting point, density, high-temperature strength and modulus of elasticity of the powder metal parts were inferior to those of pure tungsten.

Trouble was, nobody could fabricate tungsten into anything but the simplest of shapes (see photo at left above).

Then scientists at Fansteel Metallurgical Corp, North Chicago, Ill, asked themselves "Why not manufacture products from pure tungsten, if it's superior to powder metal?"

If the job could be done, it would mean a major breakthrough to several areas: (1) greater reliability and longer life in electronic tubes and controls, (2) reduction of component sizes, (3) ability to process materials at higher temperatures, (4) ability to manufacture components and assemblies with adequate strength at fantastically high operating temperatures, and (5) opening new frontiers in the exploration of metal behavior at extremely high temperatures.

And it pretty well goes without saying that America's missile and space vehicle programs would get a tremendous boost from new tungsten component developments.

Biggest problem confronting Fansteel's metallurgists: how do you work a metal with a 6152 F melting point, and tensile strength in excess of 500,000 psi? Strongest, densest, hardest and least-workable of metals, tungsten must be worked into usable form at high temperatures then heated to about 3000 F so that it can recrystallize. But in recrystallization, tungsten loses most of its ductility (tungsten is not ductile at room temperature unless it is in a fibrous state).

Tungsten actually loses ductility so fast (as temperatures drop) that if a hot tungsten part comes into contact with a cold tool in such a way that it surrounds the tool, the tungsten will shrink, the tool will expand, and the tungsten part will break.

But as tungsten cools down to 1470 F, it picks up strength as it loses ductility. Thus the tools themselves must be made from an alloy that is high-temperature resistant, and highly wear resistant.

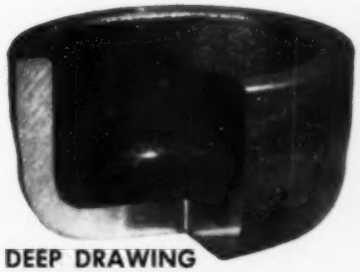
That's the general framework of problems within which Fansteel metallurgists and operating men had to work in taming tungsten. In something like six months, they came up with techniques for forging, extruding, deep-drawing and spinning the metal into undreamed of shapes and sizes.

Fansteel starts working tungsten slugs at about 3000 F, must do so very quickly so that forming is done before temperature of the work drops below 1290-1470 F (material becomes brittle at that temperature). If necessary, the piece can be reheated for further hot working, but this process inevitably loses the ductility achieved during initial forming operations. Thus final working of a piece must rebuild needed strength.

Forgings (simple rivets, rocket

NOW . . .

. . . forming at terrifically high temperatures has created new horizons in techniques and uses for this toughest of all metals



DEEP DRAWING

Cup made from 0.170-in. rolled tungsten plate. Draw radius is less than thickness of metal

FORGING AND EXTRUDING

Pieces at top show final two stages in forging. Below is a hot-extruded seamless tube

SPINNING

This reverse conical section is made by spinning rolled tungsten sheet

"toughest"-TUNGSTEN

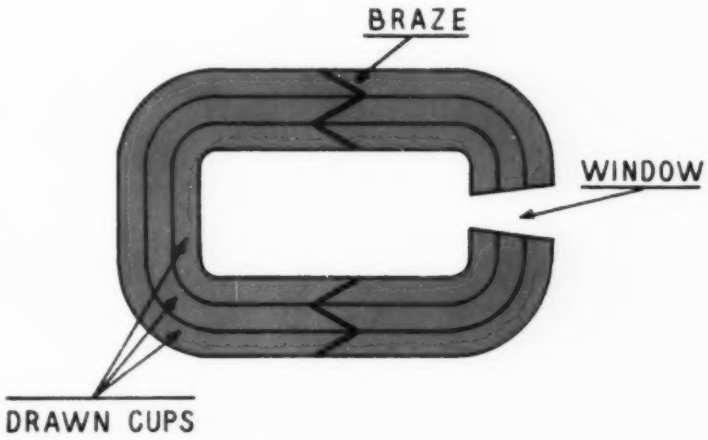
nozzle throats, electronic tube components) are made in a series of steps to take advantage of tungsten's increased ductility as it is subject to further working. Large X-ray targets, for example, are made by pressing tungsten powder into preformed shapes, which then can be sintered and forged to acceptable density.

Seamless tungsten tubing is now produced at Fansteel by hot extrusion. One tube (see illustration) was reduced by 70% of its original area—an example of the extent to which hot tungsten will flow under proper conditions. Fansteel people believe that this extruded tube could be used for drawing thinner walled tubing, or it could be hot upset to make a special shape, or cut into slices for flywheels for self-winding wrist watches, electrical contacts, or electronic tube components.

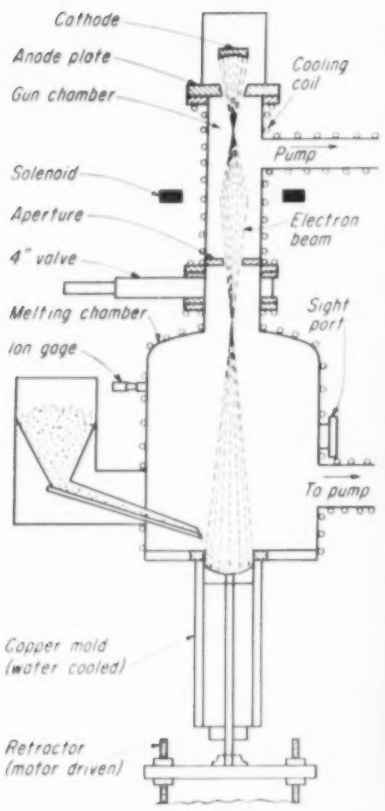
Deep drawing of tungsten, believed to be a first for Fansteel, opens up many new uses for the metal—better electronic tubes, continuous metal-evaporating equipment, and vector control devices for missiles and rockets. And deep-drawing and machining of tungsten may extend use of tungsten in gyroscope rotors, allowing a cut in size of the rotor.

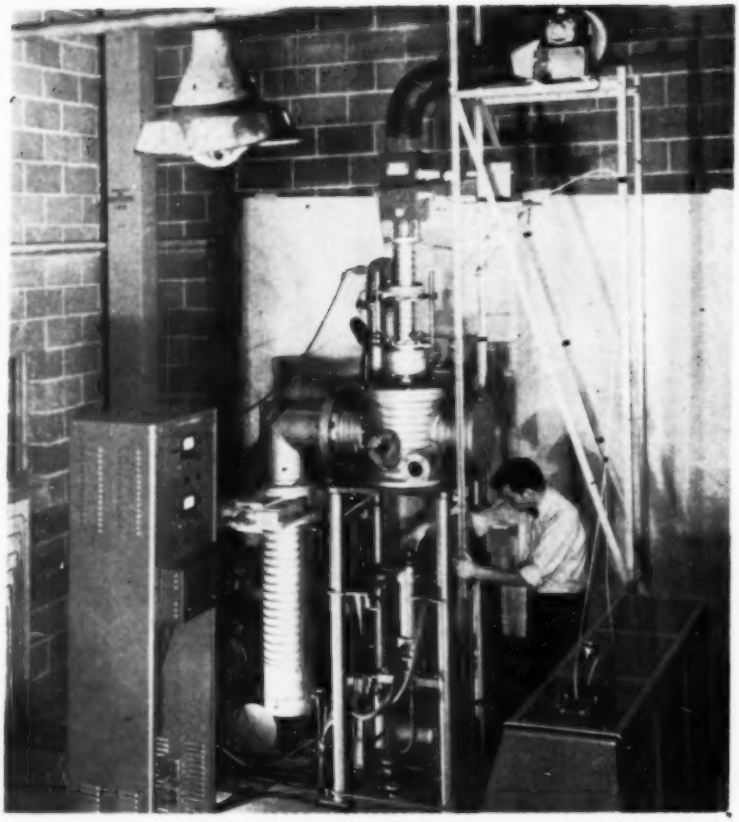
Still another application: two drawn tungsten cups brazed together with gold to form a radioisotope container, or eventually a container for the recent widely publicized 5-lb atom power plants.

"Probably the most exciting part of the tungsten fabrication development program," says company spokesman, "is the fabrication of rolled tungsten plate or sheet by spinning." This, the Fansteel people believe, has the greatest possibilities for the Space Age—for rocket nozzles, nose cones and the like.



Three-ply container for radioactive materials . . .
. . . was made by Fansteel from drawn tungsten cups fitted one within another. Brazes are made at angles to prevent possibility of straight-line radiation





Operator adjusts cold mold before fastening it against base plate with toggle clamps. As melt progresses, the lead screws will retract stool of mold, and the ingot will solidify from the bottom upward. Shape casting is also possible

Better alloys and purer metals from electron-beam furnace

Advanced Space Age metals and alloys will soon be coming out of electron furnaces in increasing quantities and with improved quality—especially the materials with high melting temperatures or extreme contamination factors—the ones that are hardest to produce with present methods.

Already, the new technique has demonstrated it can produce high-purity tantalum in 3-in.-dia ingots (100 lb) and molybdenum in 5-in. ingots. Larger ingots can be made by employing several electron guns. Other difficult materials such as zirconium, columbium, titanium, and tungsten can also be melted and purified.

Basically, this is another application of the same heat source previously reported in connection with welding (*AM*—Feb 23 '59, p95) and machining (*AM*—Mar 9 '59, p115). As in the other processes, heat is produced by bombarding the work with a stream of electrons traveling at extreme velocities through a very high vacuum.

Formerly, the best available method for melting the refractory and reactive metals was the vacuum arc furnace in which the heat comes from an arc between the electrode and the melt.

Former processes

The nonconsumable process (electrode made of carbon or tungsten) can melt scrap, sponge, pellets, or large powders, and it can hold a molten pool almost indefinitely. However, there is always some contamination from the electrode, and the arc becomes unstable at pressures below 50 mm of mercury.

In the consumable process, the electrode is made of the material that is to be melted, and it melts away to form the ingot. This arc remains stable at much lower pressures, but the process stops as soon as the electrode is melted. Thus, a molten pool cannot be maintained for thorough purification.

In contrast, the electron-beam furnace appears to have the advantages of both these processes without any of their disadvantages. It operates at lower pressures than either of them, and there is almost no limit to the temperature levels it can reach. Melting stock can be in any form: pellets, sponge, scrap, and even the fine powders that would be blown out of the mold in arc melting by the force of the arc.

Feeding can be stopped or started as desired, and a molten pool can be maintained indefinitely—while the melt is being purified, or while a time-dependent reaction is in prog-

ress. Alloying materials with high vapor pressure can be added at the last minute so they won't boil out of the melt. And there is no electrode to contaminate the material being melted and refined.

Exceptional product purity is claimed, and the degree of refinement can be predicted by comparing the vapor pressure of the impurity in question with that of the base metal at the melting point. "In many cases it has been possible to reduce impurity content by an order of magnitude when comparing electron-bombardment melting with conventional vacuum melting techniques," according to NRC Equipment Corp of Newton, Mass.

A special feature of the NRC furnace is its two-chamber design. One chamber contains the electron gun and is evacuated to a pressureof 10^{-4} to 10^{-6} mm of mercury by a 4-in. diffusion pump. The mold and the metal-feeding apparatus are in the other chamber where the pressure is normally held within the limits of 10^{-2} to 10^{-4} mm by a 10-in. pump.

An electron stream is generated by placing a large voltage potential—approximately 20,000 v—between a pure tantalum cathode and a plate. All acceleration takes place between these two elements. The power level ranges up to 60 kw, much higher, of course, than in electron-beam welding because of the larger body of metal being melted.

The 20,000-v level marks the dividing line for X-radiation. Below this level, says NRC, the rays are soft and are absorbed by the furnace walls. Above it, they penetrate the metal and require lead shielding.

Beam is focused by coil

After the beam passes the anode plate, it diverges slightly as it travels the length of the gun chamber. However, an electrical coil around the chamber focuses it so it can pass it through an aperture in the vacuum seal between the two chambers.

In the furnace chamber, the metal to be melted is fed into a water-cooled mold by a vibrating hopper mechanism. As the melting proceeds, the stool of the mold is retracted, and a pure ingot is formed. For a shaped casting, a water-cooled crucible with a skull of the material being melted is substituted for the cold mold.

The main reason for separate chambers is to protect the gun and other parts of the apparatus from high-voltage discharges. At very low pressures, a molten metal sporadically gives off dissolved gases and volatile impurities. These cause an immediate rise of pressure which may go high enough to start a high-voltage discharge, especially when metallic vapors are also present.

If the gun were in the same chamber, high-speed evacuation pumps would be required to hold the pressure below the discharge threshold. In addition, the power supply would need special protective devices. NRC claims to have a less expensive solution to the problem with its two-chamber design. The pumping system can be smaller and the power supply less complex.

Obviously, the electron-beam furnace is not going to replace all other types of furnace. The process is relatively expensive, and the ingot sizes will always be small compared with those of the steel industry, for instance.

However, it does appear to show promise for melting, refining, and even shape casting the refractory and reactive metals and alloys where high temperature and freedom from contamination are important.

Electron-beam welding equipment, which the company also makes, will figure in about the same field—welding the materials that are difficult or impossible to weld by other methods.

Khrushchev meets British machine tool builders at Leipzig

East Germany's recent Leipzig Fair was the scene of a meeting between Russian Prime Minister Nikita Khrushchev and representatives of three British machine tool building firms at the collective British exhibit. The informal meeting was convened at Khrushchev's request and significantly, only two other machine tool builders were invited—one from West Germany and one from Switzerland.

Six machines ordered

Reading clockwise around table from lower left: M Stoliarov, vice president of Russia's Stankoimport; H J Dorman of Britain's Dowding & Doll, an interpreter, Khrushchev, another interpreter, Guy Chesham, public relations, Britain's Machine Tool Trades Association; Messrs Gonryf and Saxby of Coventry Gage & Tool; Mr. Hobbs of Newall, and a representative of Switzerland's Dixi. Not shown is representative of Germany's Klingelberg. Out of the meeting came Russian orders for six machines from the three British companies.

Blankets bypass brazing furnace

Electric blankets, like the ones shown here, completely eliminate the need for brazing furnaces—will bring the cost of brazed honeycomb down to somewhere around the cost of the adhesive-bonded sandwiches, say the developers of the new technique.

Considerably less power, less time, less space, less handling, are all claimed by the two California companies: Rohr Aircraft Corp. of Chula Vista and Electrofilm, Inc, of Van Nuys. In addition, the process is much more flexible than a furnace and can braze honeycomb structures of all sizes and shapes, a special advantage for the big sections that now tax furnace capacity to the utmost.

For example, Rohr recently had to braze a 6 x 12-ft honeycomb structure. The job was completed, but with a good deal of difficulty, and it required the largest furnace in the plant.

Now, by covering the work with the new blankets, parts of this size —and larger—can be brazed quickly and easily anywhere in the plant. Furnaces don't even enter the picture. And part size will become more and more important with the new wide-sheet-rolling program now turning out honeycomb skins up to 10 ft wide.

These honeycomb structures, whether brazed in a furnace or under blankets, consist of a steel outer skin, a layer of brazing alloy, honeycomb, brazing alloy again, and another skin. Because the silver alloy is very sensitive to oxidation, the whole sandwich is welded into a steel container which is evacuated and then filled with argon for the brazing cycle.

In furnace brazing, a large percentage of the heat goes into raising the temperature of the furnace itself. A typical cycle raises it to brazing temperature (600 to 1800 F), holds it there, reduces it to 600 F, and later, raises it back up to 1000 F to age the steel for maximum strength. Handling is another large item of expense.

When the blankets are employed, the work is subjected to the same heating cycle, of course, but the whole operation is much quicker and easier. Most of the heat goes right into the work without having to heat up the mass of a furnace. Thus, the power requirements are much lower.

The blanket is made of high-temperature silica insulation with high-temperature wire-mesh heaters inside. Reliability, control, and life of the blankets are good. The ones under current tests withstand 50 cycles, and a 100-cycle life is considered reasonable.

Irregular shapes, thin edges, and other configurations that tend to distort in furnace brazing will be brazed better with the blanket technique. In making big sections, several small blankets will probably be employed.

Individual control of each blanket can put exactly the right amount of heat in each area. Further, if one blanket fails, it can be replaced without causing the downtime that would be suffered if one big blanket failed—or if a furnace failed.

Obviously, the blanket technique will require less floor space than a furnace would. A 6 by 12-ft furnace takes up about 12 x 25 ft of floor space, plus another 12 x 20 ft for the loading car tracks. In contrast with this, the blanket system needs only about one or two feet on each side of the section being heated.

In operation, a single control panel can take one blanket-brazing setup through its cycle and then start immediately on another. **And, by eliminating the long lag time required to cycle huge furnaces through the brazing operation, the blankets are expected to cut total brazing time from as much as 15 hours to around 2 hours.**

What the new *International Inch* will mean to U S Metalworking, II

Discussions from gage and instrument makers on the significance of the July 1 changeover to the International Inch were published February 23, page 89. We promised you more opinions. Here they are, plus a historical summary of an inch that has been with us a long time, although not legally

"No effect on 99% of measurements"

George B Webber, partner
Webber Gage Co, Cleveland, O

The scheduled July 1 change to the International Inch will have no effect on 99% of the measurements made in this country.

The change is only two millionths of an inch per inch of length. In all instances pertaining to gage blocks, only recalibration will be required. In the case of working gage blocks, I do not believe that an extra calibration will be needed—only that at the standard frequency for quality control. The "master" or "grand master" blocks are more critical. Such blocks should be recalibrated by the Bureau of Standards or any capable, reputable inspection laboratory. This category, of course, includes all gage-block manufacturers.

Our quality-control staff was advised of the change. Steps were taken in sizing of gage blocks so that our production and inventory will fall within the required tolerances.

The international agreement was made at an opportune time. Production standards and tolerances of all industries are being tightened to such an extent that an International Inch is a necessity.

"Great step toward a goal"

Edward Johannson,
president
C E Johannson Gage Co, Detroit, Mich

The changeover to the International Inch system has very little effect, if any, on inspection of commercial and industrial products made to tolerances of rather coarse limits, that is tolerances not finer than 50 microinches. The gage blocks now used for inspection of such parts can still be used without reworking them, even when the new inch system comes into effect.

For the inspection of products manufactured to very close tolerances, such as gage blocks themselves and parts of very high quality for laboratory and scientific calibrations, it is recommended that existing master gage block sets be reworked. These master sets could be used for calibration of precision gages after the new Inch is put into effect. However, a correction of –2 microinches per inch length must then be taken into consideration. This practice could involve errors of miscalculation. Calibration and reworking of the old master sets is therefore recommended.

Our company will calibrate gage blocks in accordance with the International Inch, effective July 1. And we will rework a user's set at any time.

The International Inch is not new to us. The Johansson Co has since 1912 made gage blocks in accordance with this inch system. In the book, "C E J/The Master of Measurements," pages 118 to 124, there is recorded the early work done on creating a world-wide common inch system.

The decision now taken by the English-speaking countries to adopt the International Inch and Yard System is a great step toward the goal of a common measuring system for the world, namely the Metric System.

For the manufacturers of gage blocks and precision instruments and parts, the adoption of the International Inch system is of great significance. It will simplify to great extent the manufacturing of such articles, besides bringing countries and peoples closer together.

"No problem for us"

Ralph V Ellstrom,
vice president—sales
Dearborn Gage Co, Dearborn, Mich

Our comments regarding the International Inch are:

1. The International Inch will not create any particular problem for us, and even less of a problem for most of our customers.

2. Length standards and master gage blocks will be reworked, but this will be done gradually over a period of time.

3. We will calibrate to the new standard beginning July 1.

"Almost thirty-three years old"

Pierre Martin,
Head of Metrology
Societe Genevoise D'Instruments de Physique, Geneva, Switzerland

It is gratifying to hear that the English-speaking countries have at last legally introduced a common definition for their standard of length.

The difference between the two inches, as defined by American and English law respectively, was slight:

less than 4 millionths

Still it has repeatedly lead to errors and misunderstandings, when measurements of the highest accuracy were concerned.

The agreement reached on Jan 1, 1959 does not, in fact, introduce a *new inch*, but comes as an official sanction of the relation between the inch and the millimeter which was adopted as far back as April 20, 1926.

H W Bearce, at the time senior physicist at the National Bureau of Standards in Washington, wrote in Scientific Paper No. 535 of the Bureau (dated Sept 22, 1926):

"At a meeting held in New York on April 20, 1926, by chairmen and secretaries of the national standardizing bodies of various countries. It was voted to adopt the relation . . . 1 inch = 25.4 millimeters."

This conversion factor has been widely applied in the last 33 years. All SIP jig boring and milling, as well as measuring machines, delivered to the USA and Canada have been calibrated in what has now just become the new "International Inch."

"No practical consequences to us"

Edgar W Bolles
Micrometrical Manufacturing Co,
Ann Arbor, Mich

In our production we do not use tolerances less than 0.0001 in., and thus the change would not effect our own gaging laboratory.

Because we manufacture ultra-precision dimensional gaging equipment, it might be presumed that the International Inch would have an effect. This is not the case because our total travel on equipment is not usually more than 0.020 in. The fact that any dimensional reading up to 0.020 in. is off by 0.000002 in. is of no practical consequence.

In spite of this fact we would deem it advisable to calibrate to the new standard, even though equipment calibrated to the old standard would be just as accurate for the very best of present-day gaging.

"We'll change over at once..."

J K Emory
Van Keuren Co
Watertown, Mass

All standards will be recalibrated to the International Inch, based on absolute wave-length measurements by interferometry.

Customers may require their standards recalibrated to international inch where their requirements are influenced by 0.000002-in.-per-inch changes, otherwise it probably will not be necessary.

Recommend masters be reworked only where recalibration to International Inch results in exceeding individual gage tolerances generally not expected likely.

Transfer of all corrected calibrations should be successful on any comparator having sensitivity and repeatability of 0.000001 in. per inch or finer scale linearity should be capable of same precision over total size difference between gages being compared.

Van Keuren will calibrate to new standard effective at once. Designation of calibration in international units will be made on all gage blocks and on all other gages where for the required precision the calibrated values would be different from older NBS inch units.

"History of the International Inch"

V G Grey,
mechanical engineer,
American Standards Association,
New York, NY

Historical aspects of the new inch are: In 1921 the American Standards Association (then called the American Engineering Standards Committee) recommended "that for ordinary industrial purposes in which measured or specified linear dimensions in inches are to be converted to millimeters, the following relation be used:

"1 inch = 25.4 millimeters."

In April 1926, the Third International Conference of chairmen and secretaries of the national standardizing bodies laid the basis for the International Standards Association (ISA). The Conference unanimously recommended the ratio 25.4 for ultimate adoption as the legal ratio in the countries concerned. Until this could be brought about the participants adopted the 25.4 ratio for industrial use.

On March 7, 1932 the Ford Motor Co requested the American Standards Association to make arrangements for having industry in this country consider the adoption of an American Standard specifying the use of the value 25.4 as the conversion factor. A special committee submitted a proposed draft that contained three conversion tables based on the 25.4 ratio, supplemented by rules for conversion practice. After general acceptance, the document was approved as ASA standard B48.1—1933.

In August 1934, the International Standards Association (mentioned earlier) approved and published ISA Bulletin 6, Conversion Tables Inches-Millimeters using the 25.4 ratio. Sixteen countries supported the standard.

After World War II the International Organization for Standardization (ISO) was formed to carry on the work of the ISA (disbanded just prior to the war). One technical committee prepared a standard, identified as ISO Recommendation R31, which includes in addition to many other quantities and units, the 25.4 ratio. The standard was approved in 1958 by 25 countries.

On Feb 17, 1959 another review of the American Standard B48.1-1933 (R 1947) was made, to see whether it should again be reaffirmed. The ASA Standards Board heard a report on the present move to change the United States legal inch which would thereby bring it into complete accord with the provisions of the American Standard. The Board decided that a committee should review the necessity of having an American Standard if the proposed new law is passed establishing the 25.4 ratio.

Induction heater hardens thin-wall parts

Selective hardening of two widely separated bearing surfaces on slender shafts is not an easy job when you're turning out production quantities. Complicating the job even further, the shafts are made of thin-wall tubing and must be free from scale distortion. By going to induction heating, Buick solved the problem and, meanwhile, boosted production

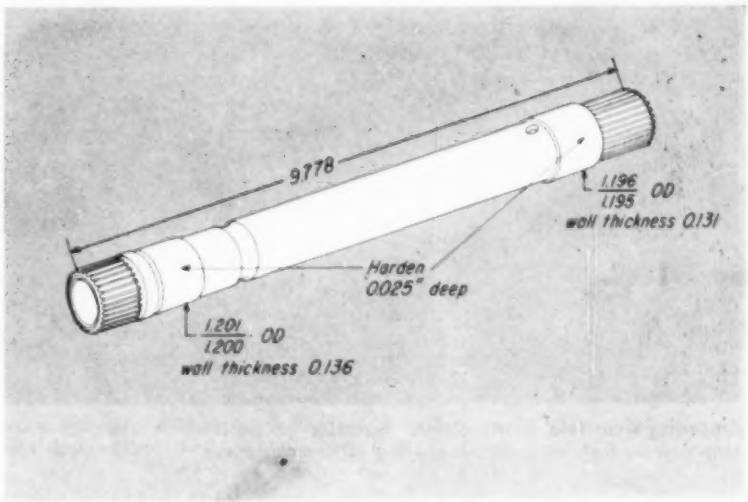
The part to be hardened is a turbine shaft made of SAE 1041 thin-wall steel tubing, heat treated and drawn to 32-36 Rockwell C before hardening the bearing surfaces. Wall thickness at the bearing surfaces is 0.136 in. maximum, and the depth of case hardening is held to 0.025 in.

To meet production demands and to get the rapid heating needed to avoid scale distortion, Buick turned to high-frequency induction heating. And because the parts were of a standard size and shape, it was possible to automate the feeding, loading and cycling of the shafts. The heating unit chosen was a Cincinnati 30-kw Inductron capable of operating at maximum power density at 1200 to 1400 kc, providing rapid heating, freedom from scale distortion, and a thin case.

An automatic process

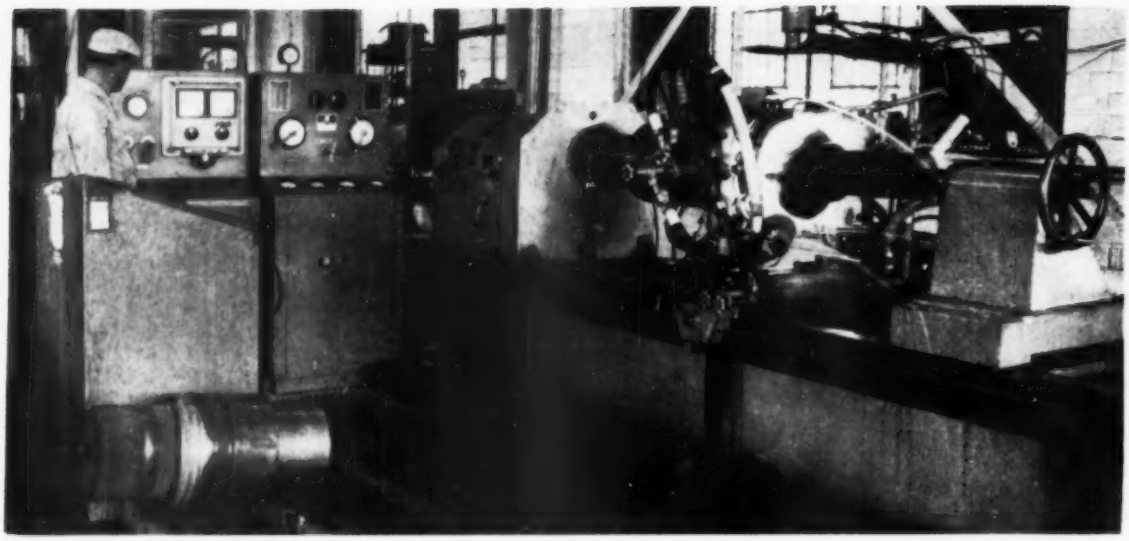
An operator fills the magazine loader with shafts, but from here on the operation is automatic, handling one shaft at a time. The shaft is transferred from the Feedall loader to air-operated arms that position it vertically in the induction coil. Here the shaft is held between centers on a slide, with the lower bearing surface aligned in the coil. The shaft rotates during the heating cycle and, at the same time, is sprayed with quenching oil.

When the lower bearing has been hardened, the slide moves down to place the upper bearing in the coil. The process is then repeated, and the part automatically ejected. It drops to a continuous-mesh belt that carries it through an integral oil cooling tank to an unloading station. From this station the shafts go directly to the finish grinding operation; no straightening is necessary after the hardening. Present production rate, boosted by the rapid heating and automatic handling procedures, is one shaft every 19.6 seconds, a considerable increase over previous rates.



Thin-wall turbine shaft . . .
is case hardened to a depth of 0.025 in. on two widely separated bearing surfaces. Induction heating gives a thin case and prevents distortion. Rapid heating combined with automatic handling boosted production rate to one shaft every 19.6 seconds

Induction heating coil . . .
heats one bearing surface at a time. The shaft rotates between centers on a slide that moves vertically to present each bearing surface to the coil. Oil spray provides simultaneous quench. After hardening, shaft is ejected, passed through a cooling tank, unloaded, and then finish ground



Operator's console assures precise correlation of spindle speed, burner feed, water quench and flow of natural gas and oxygen for automatic or semi-automatic operation. Spin flame hardening is applied to rotatable parts

Rolls spin in flame

By T W Bergquist, metallurgist
Ellwood City Forge Co, Ellwood City, Pa

Natural gas is burned with oxygen to flame harden alloy-steel rolls up to 14 in. dia and up to 17½ ft long. Depth and degree of hardness are satisfactory on various alloy steels. Feed rate for progressive spin hardening averages 2 ipm; the depth of hardness runs from ½ to ¾ in. but can be more

A "Do-It-Yourself" decision at Ellwood City Forge Co has run up some highly welcome savings and produced excellent results in the flame hardening of alloy steel rolls, both straight and tapered. Ellwood feels it has improved quality of its product beyond expectations and at the same time cut its flame-hardening costs in half. Handling as well as production time have also been cut sharply.

Until two years ago the company, makers and finishers of open die forgings, had been sub-contracting flame hardening of the many small- to medium-diameter rolls turned out by the plant.

The do-it-yourself concept was analyzed and studied from all angles by company management and finally culminated in the purchase of a newly designed Peddinghaus progressive spin hardener. The machine was intended for oxygen-methane operation. With economy in mind the company consulted Manufacturers Light & Heat Co, a subsidiary of the Columbia Gas System, Inc, the local natural-gas utility, to determine the methane content of the gas delivered to the plant. Natural gas was substituted for methane. Coming directly from the service main, natural gas eliminated the need for a tank farm, delivery and inventory. Because the plant already used quantities of natural gas for other applications, the cost was very favorable.

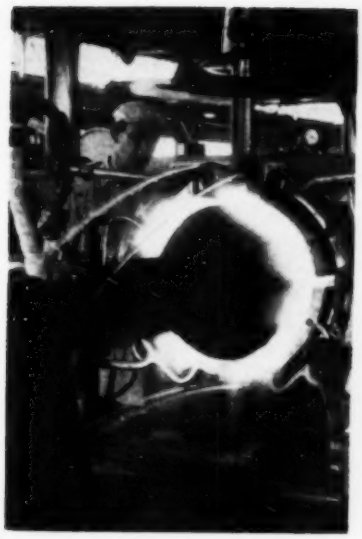
In appearance, the Peddinghaus hardener resembles a lathe and accommodates workpieces up to 17½ ft long. The workpiece is mounted on a spindle that rotates at a preselected speed while a ring of fire followed closely by one of water progresses along the length of the roll being hardened. The flame heats and the water acts as an immediate quench.

Automatic or semi-automatic operation is possible with the machine. Type of operation can be selected from an operator's console, which houses flow-meters, pressure gages, and controls for the precise correlation of spindle speed, forward speed of burner and quenching rings, regulation of the natural gas and oxygen flame, and the pressure of the water in the quench spray head.

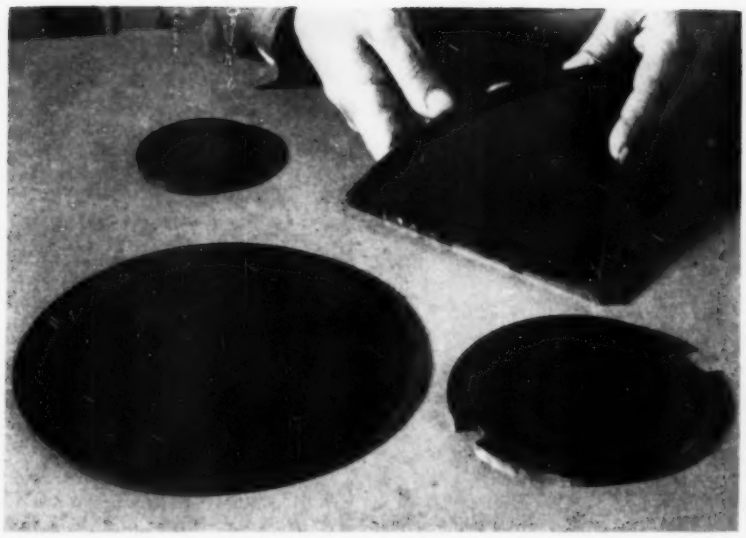
An electric eye, suspended over the workpiece, travels with the burners and gives warning if heat of the piece does not meet a predetermined temperature setting. Because the flame temperature is in excess of 2000 F and desired hardening temperature is usually between 1600-1700 F, the eye is a safeguard.

During more than a year of operation on natural gas and oxygen, the machine has handled pieces ranging up to the maximum 17½ ft in length. Roll diameters, straight and tapered, have ranged from 2 to 16 in.

Depth, uniform thickness and de-



Natural gas is used instead of methane, eliminates need for a tank farm



Uniform depth of hardening is obtained. Straight or tapered rolls in various alloy steels have been successfully flame hardened

for surface hardening

gree of hardness achieved by Ellwood City Forge have been satisfactory and sometimes surprising. For example, at an average speed of 2 ipm, a 4-in.-dia roll has been hardened to a depth of ¾ in., and a 14-in.-dia roll to a depth of ½ in. Tests conducted by Ellwood City Forge have demonstrated that it is possible, with careful control and skill, to harden nearly any steel to its maximum hardness at a satisfactory production rate.

This is the way the hardener operates: The piece is brought into position by a crane and picked up by the lathe centers. The water-cooled copper burner and spray heads are selected and set into position.

The burner and water rings are set up and connected rigidly in tandem with a space between. The depth of hardness required is influenced by speed, diameter of workpiece and other factors. Each ring is composed of four quadrants that, when assembled, form a sort of collar. A series of six burner and spray ring sizes, each applicable over a 2-in. dia range, can be quickly changed to suit the job.

The inside surfaces of the rings are lined with rows of tiny holes. In the case of the burner, the two leading rows of holes are for preheat, the last two are for hardening.

The water ring with its spray provides a simultaneous quench. After the burner and water rings have been assembled, the electric eye, composed of photoelectric cell, tungsten bulb and motor, is set, focused and positioned.

A pipe line feeds oxygen from a Linde Cascade unit to the control console. Natural gas is brought in by a line from the plant main and water directly from the main. After the ratios for the job are determined, the console controls are set. Flowmeters control the amounts of gas, oxygen and water. A table on the console enables the operator to determine the correct settings.

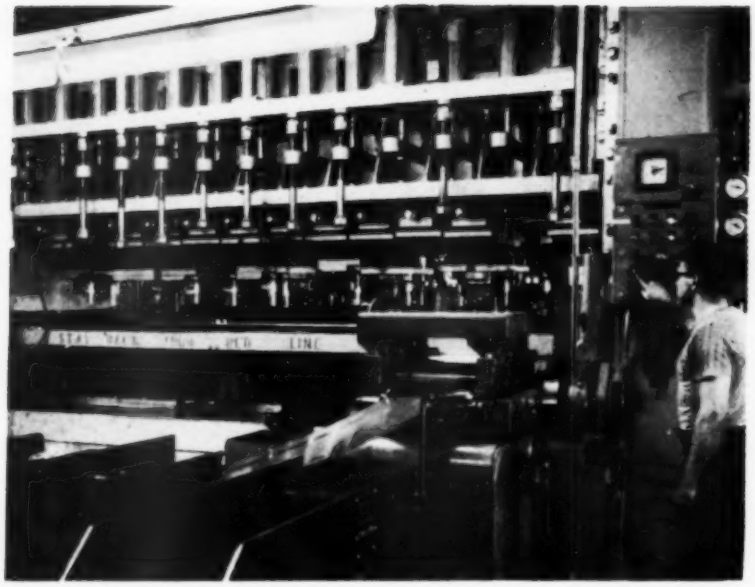
Depending on the depth of hardness required, steel type, etc, spindle speed and forward speed of the burner and quenching heads are determined by the depth of hardness required and type of steel.

After all the requirements have been considered and the machine adjusted accordingly, the burner is blown out with air to dislodge any water that may have accumulated from the water spray. Now the burner is ignited. Burner feed rate and spindle speed are engaged. Water is turned on and a final check made to make certain that water pressure is not so high that it throws spray into the flame.

The machine operator keeps careful check on the process. The operator at Ellwood City was selected from plant personnel and trained specially for the job. During the two years the machine has been in operation, he has become adept at the fine points of scientific machine spin hardening. Color of flame has special meaning to him (it should be a rich blue). The roll being processed should ride so its surface is at the tip of the blue area of the flame.

The machine is, as stated above, capable of completely automatic operation, but for jobs that require extreme care and attention it is operated on a semi-automatic basis. The operator then makes fine periodic adjustments in the flame characteristics, water and speed.

Speed of operation of the setup has enabled Ellwood City Forge to accept flame hardening jobs from others when the machine is not occupied with the company's products. The fast service and excellent results of the natural gas-oxygen horizontal spin hardener have brought many satisfied customers back again. And each job completed in effect reduces the cost of the machine, its operation and the cost of hardening.



Press holds machining tolerances on coil stock delivered from Littell straightener to a 600-ton Verson Transmat. Ten stations blank, form, pierce, and trim motor brackets at 25/min

Adaptable automation

. . . simplify the manufacture of two entirely different types of fractional-horsepower motors in 30 different sizes and styles. Here are ideas from stamping, machining, and assembly setups that were developed to overcome manufacturing problems arising from mixed production of a product having a seasonal market.

By George H. DeGroat
Detroit Editor

All work in process at the Westinghouse Electric Corp Small Motor plant in Upper Sandusky, Ohio, is conveyorized until it becomes a finished product—ready for shipment. Ample conveyor capacity provides temporary storage facilities between operations wherever necessary to reduce handling of material in process.

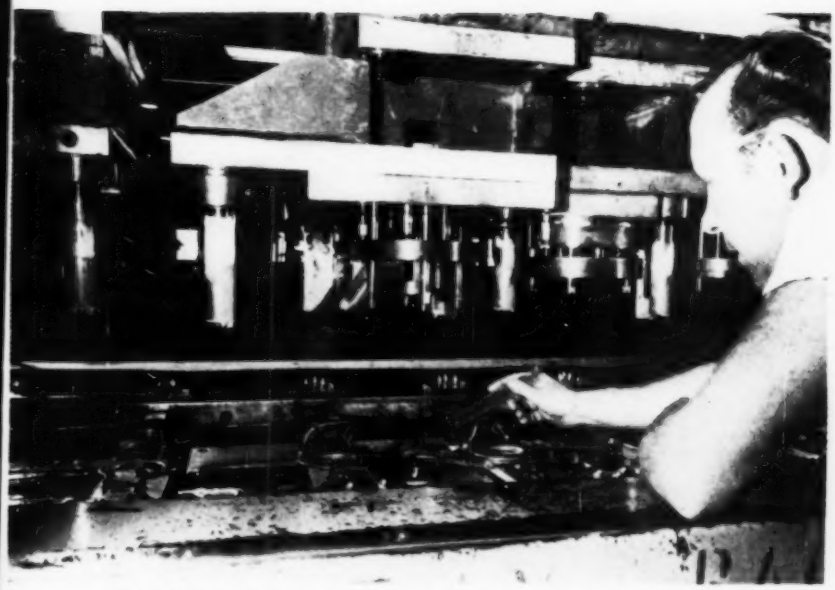
Five basic production lines have been established here; motor end bells, or brackets; laminations; shafts; stators; and rotors. The major lamination and shaft lines are completely automatic from start to finish—the other lines are conveyorized and mechanized. An assembly conveyor passes the end of each component line, picking up completed parts. By the time this conveyor passes over assembly work tables, each rack on the conveyor contains two complete sets of motor parts.

In this way, the plant produces at a fairly even level throughout the year — stocking motors in slack months to handle peak demands.

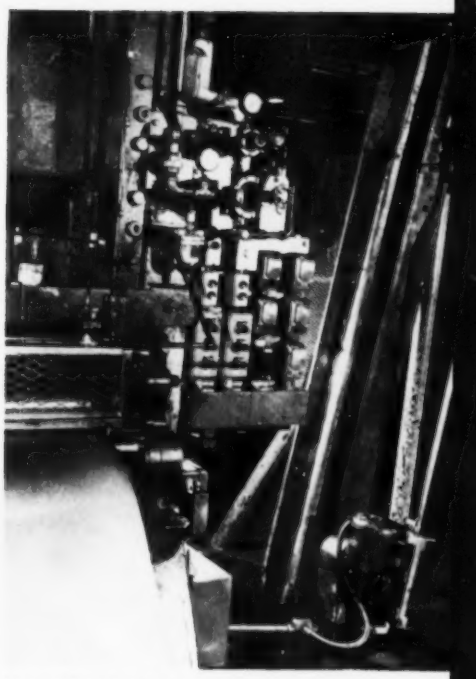
Bracket Production

. . . is typical of the flexibility in manufacturing. Coil stock from a reel and straightener is fed automatically to a 600-ton Transmat in which two different kinds of brackets can be made. Changeover time from one to another is about six hours.

In the same line, bearing caps are made in progressive dies in other presses and the two parts are thereafter processed through the remainder of the line together. An operator manually loads brackets and bearing caps on chain-driven hangers that carry them through an automatic washing and drying process. This removes die compounds and adds a phosphate coat for rust prevention and paint adhesion. After drying, the brackets are conveyed to a painting area while bearing caps are automatically directed to the bracket-assembly area. At the painting station, the brackets are loaded



Side drain holes are pierced in motor brackets by side-acting punch to save second operations. Operator is protected by photocell circuit that is sensitive even to smoke



Motor laminations start with 0.024-in. stock at 200-ton Bliss. Sand-blasted matte finish prevents sticking

and mechanized lines...

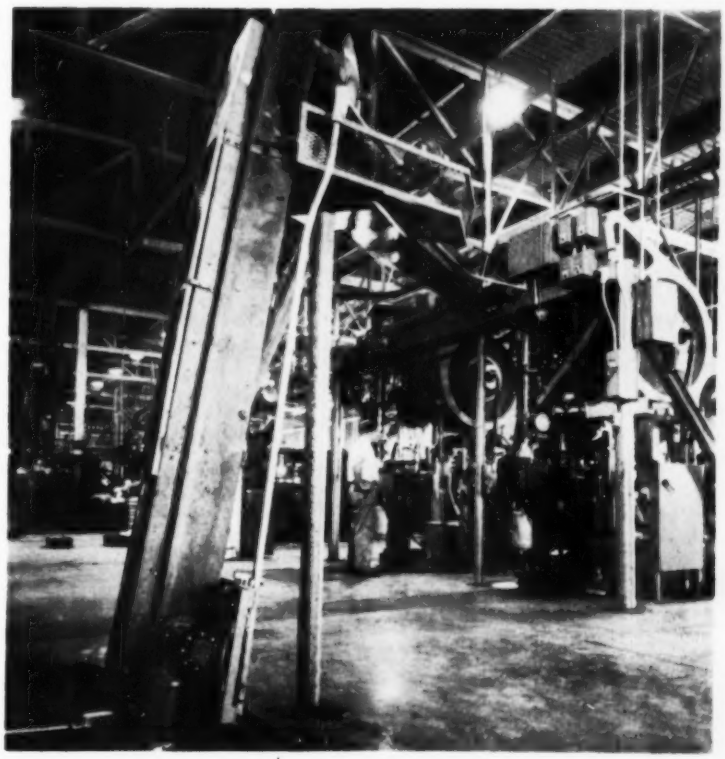
on rotating pedestals mounted on a conveyor so the inner surfaces can be painted with lacquer. Automatic air drying follows, after which they are transferred to a storage conveyor.

At the assembly area, lead holes are punched in the brackets by a special hydraulic fixture, and eyelets are inserted by operator using a special eyeleting machine.

One operator subassembles bearings and wicks to brackets and places them on an automatic turntable. A second operator removes them from the turntable and places a bracket subassembly and bearing into a special press, which cycles automatically, assembling the bearing cap to the bracket subassembly and injecting a special lubricant.

Two Lamination Press Lines

Lamination production is even more automatic. It starts by stamping circular discs from coiled SAE-1010 stock at a 200-ton Bliss press. These blanks are delivered upon demand to two lines of three 75-ton Minster presses by means of an overhead conveyor. One line produces stator and rotor laminations for split capacitor motors—the other, similar laminations for shaded-pole motors. First press in each line pierces the rotor section in the blanks, the sec-



Two lines of three 75-ton Minster presses are fed from magnetic conveyor on demand by hopper level

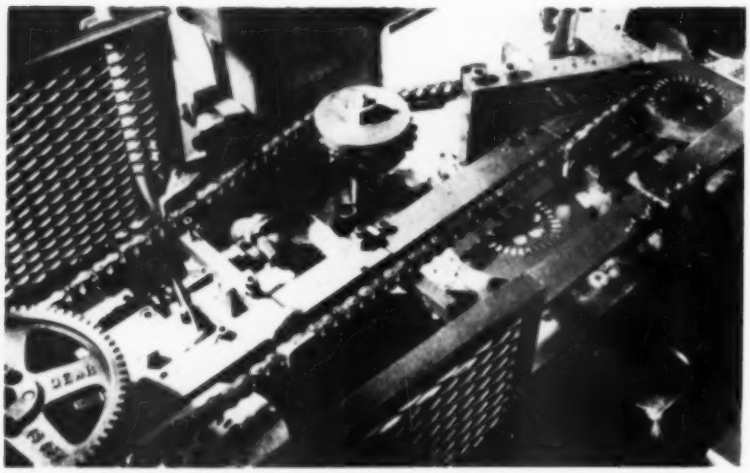
ond separates the rotor and stator, and the third pierces the stator slots. The three presses in each line are electrically interlocked to stop automatically if a stoppage or some other failure occurs. Transfer of laminations between presses is entirely automatic.

Annealing is automatic, too, in controlled-atmosphere electric furnaces that deliver stator and rotor stampings to storage conveyors where they remain until needed.

Special Setups

. . . assemble rotor stampings in stacks and semiautomatically pressure-measure them. For this work a press with a 3-station indexing table and a stack-height indicator is used. Stacks are then automatically oriented by vibrating them over three stationary pins until the pins line up with vent holes in the laminations. Rotor skew is obtained by means of a fixture with three helical pins that are inserted through the vent holes. Dummy shafts—essentially short arbors—are then pressed through the stack. These shafts facilitate subsequent operations.

Automatic die casting follows, after which OD's are turned in special lathes and a post heating operation is performed. This improves the electrical characteristics of the completed rotor and expands it for shrink-fit assembly with the permanent shaft. Post heating is completely automatic and—after the shaft is assembled—the rotors are automatically transferred to a conveyor for delivery to the assembly area.



Shuttle feed moves 132 rotor sections/min between blanking presses

Stators Are Stacked

. . . and pressure-measured in a special press setup, too. The core stacks are placed on a four-station indexing table where the laminations are automatically oriented by dropping them over rotating bullet-shaped arbors. As each lamination spins and slides down the arbor, a small keyway on its outer periphery engages a key on a stationary fixture at this station. Rivets are then inserted manually.

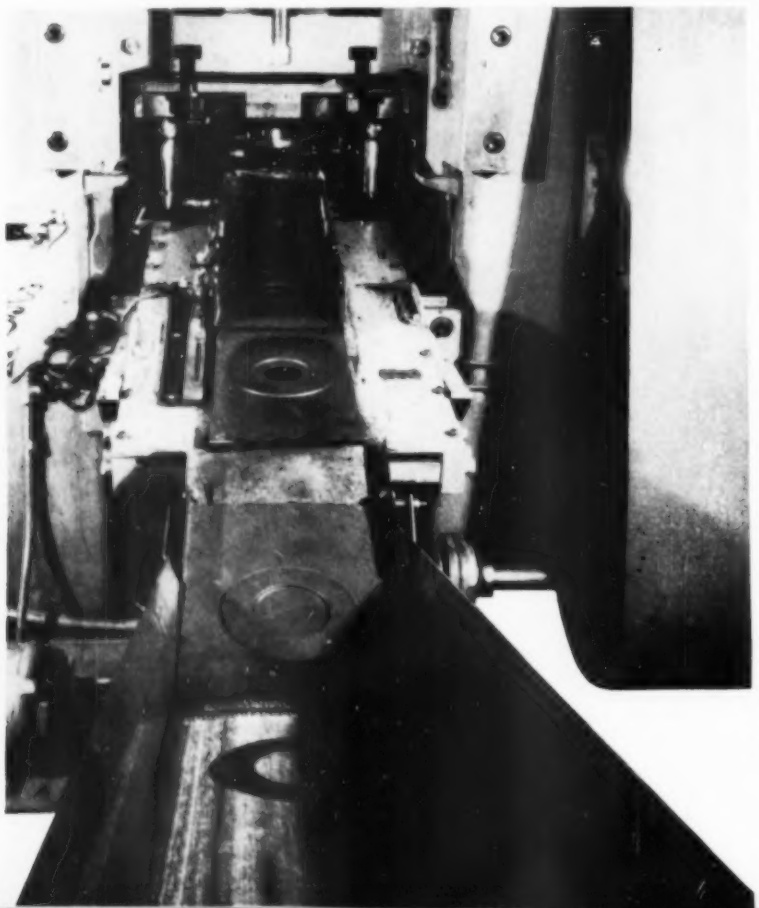
At a special riveting setup—consisting of a press and a fixture—the rivets are driven automatically while the ID of the stack is simultaneously burnished. An automatic unloading arm places the cores on a conveyor for transfer to two lathes that turn the ends to fit motor brackets.

Here a core is supported on an expanding arbor and the lathe tailstock supports the arbor.

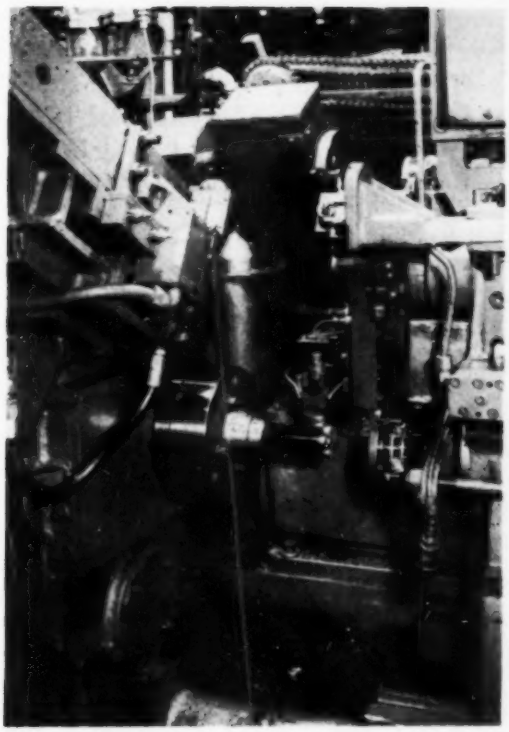
A specially formed one-piece shading coil of copper or brass is slipped over the pole tips of shaded-pole cores. This single-piece construction eliminates soldering or welding.

The stator winding area is divided for shaded-pole and split-capacitor designs and special machines are employed in each section.

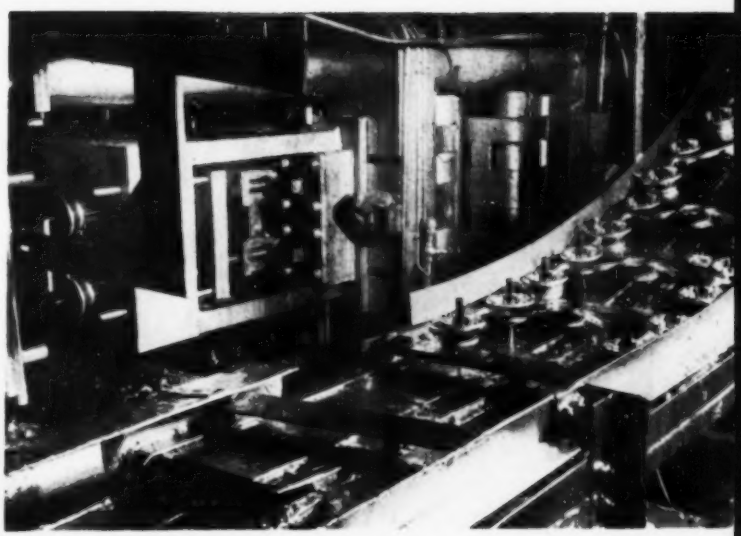
Stator impregnation with insulating varnish is completely automatic. Two wound stators are supported on their OD's on a chain-driven hook—and six are dipped simultaneously in a rise-and-fall varnish tank. They are then conveyed automatically through a gas-fired varnish-baking oven.



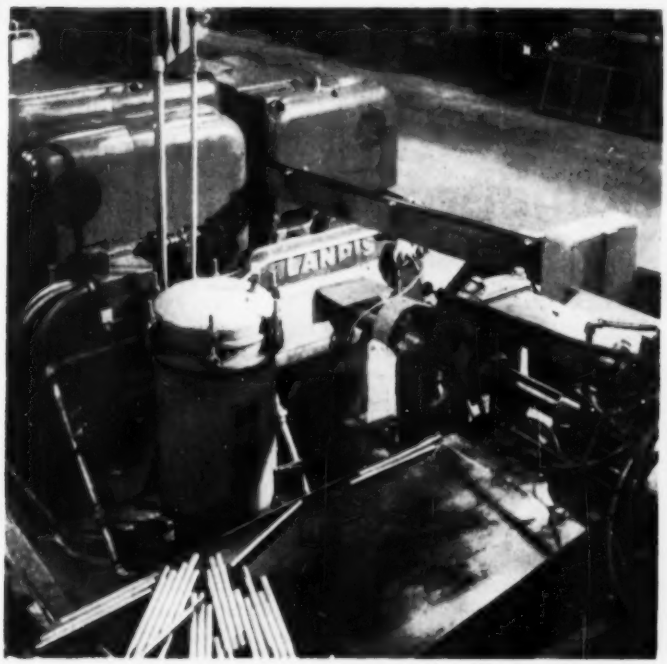
Magnetic shuttle unloads stator sections after rotors have been removed from centers. Belt takes stators to third press for piercing



Feedback controls tool replacement in rotor-turning lathe. Three-position fixture on lathe tailstock picks up rotor from conveyor, positions it 120° away on lathe arbor for OD turning, then indexes it 120° to air gage that seggregates rejects

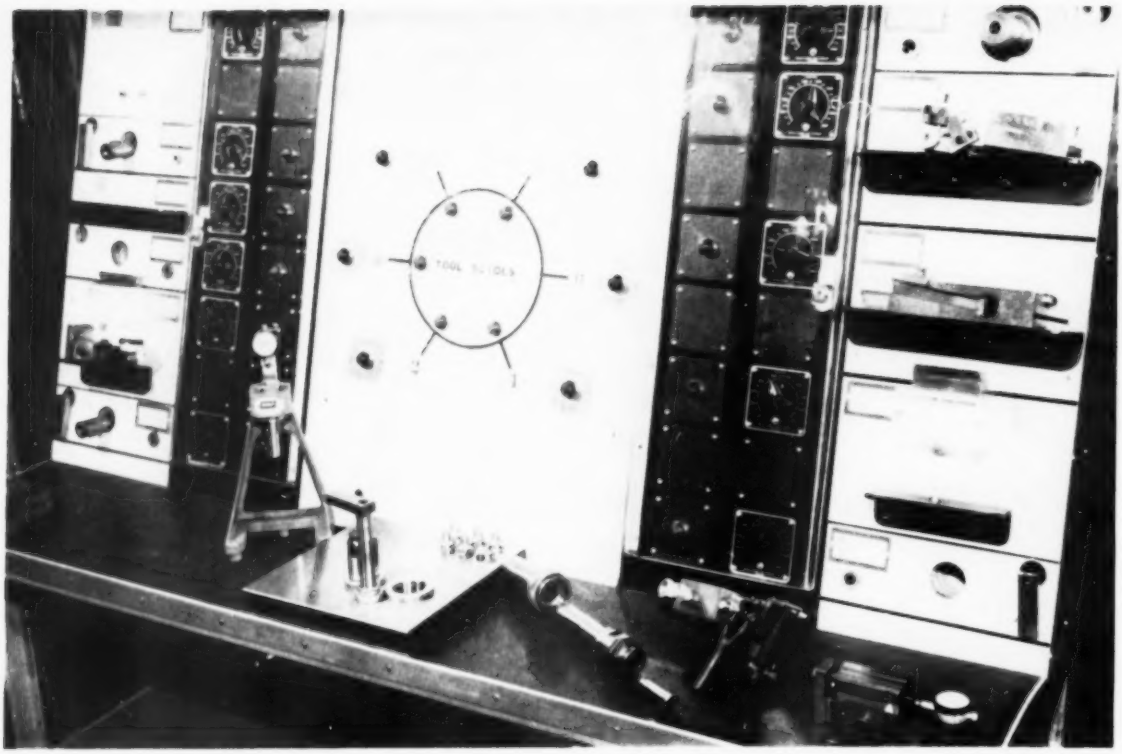


Four rotors at a time are die-cast around stacked and skewed laminations. Parts are manually loaded into press, but mechanically ejected and placed on cooling conveyor



Shaft machining is automatic from chamfering and cutoff to centerless grinding. Chain conveyor takes shafts to straddle mill that cuts flats

Conveyorized assembly brings all motor parts to three stations. Assembled motors are placed on test conveyor



Tool-control center schedules regrinds and optical inspections as . . .

Comapro Reports on machining rates

Initial report of Cooperative Machining Project (Comapro), centered at Cone Automatic Machine Co, indicates success in integrating 17-company research into machining rates for high-production parts. After 40,000 spark-plug shells (the first sample part) have been run off, some conclusions can already be made.

Six factors seem most important to an integrated program to improve machining efficiency; bar stock, tooling and tool maintenance, the machine tool (a multi-spindle bar automatic), measurement control, coolant and lubrication, and personnel.

Because about 85% of the tooling for present-day bar automatics is HSS, that tool material was chosen for the machining tests. Quick-change toolholders were installed as much as possible—with the result that retooling time has been reduced to a fraction of conventional retooling time. One example is for a drilling operation, where conventional tools were usually changed in about 4½ min, but quick-change tools are now replaced in 27 sec.

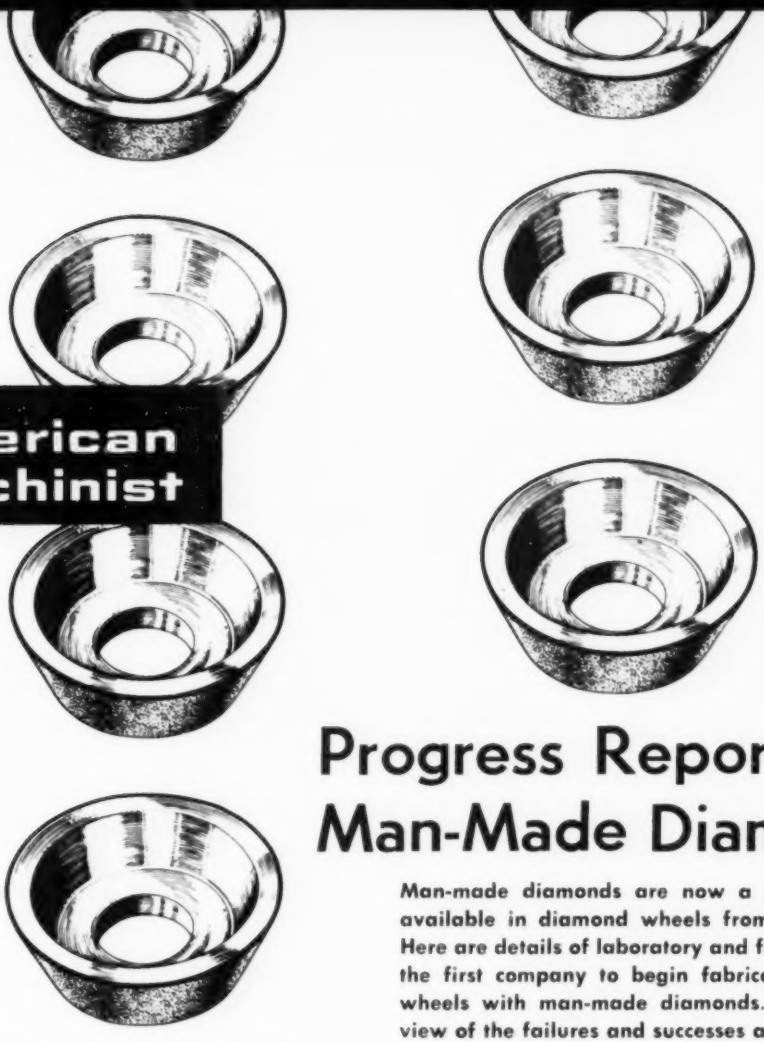
Critical down-time items have shown up. Job change, tool change, stock loading, lubrication, and machine maintenance are the major problems. Maintenance, however, has not proved difficult during the run of 40,000 parts; it is fundamentally a machine-design and construction factor. Lubrication has been solved with an automatic system that distributes liquid grease to 65 points in the machine.

Stock is fed continuously end to end into the machine from reels; but a side-loading stock feed will be considered later. Next to tooling, stock is considered the most important factor in machining tests. Material for the spark-plug shells is leaded type A cold-drawn steel. Extensive hardness tests showed a range from 91-93 R_B on the cold-finished OD, and from 89-91 on the machined surfaces. One of the items under study is the economic advantage of using the premium leaded steel, for its machining advantages, over less expensive stock that may cost more in machining time and tool wear.

Machining cycle time for the test part is 4.41 sec; but more tests must be conducted to provide a realistic cost figure.

Equipment available to the Comapro program and being utilized in the tests includes an optical comparator for tool checking and work measurement, a drill pointer, a surface grinder, a radial-relief grinder, a hardness tester, and a surface-finish tester. Gages of several types are being applied to check the work when finished and in progress.

On all of these operations there are complete records, and any inquiries can be answered, and are encouraged. Because of the detail included in the program, considerably more information about each operation will be available on the test parts; a feature not usually available on a production part.



American Machinist

Progress Report on Man-Made Diamonds

Man-made diamonds are now a practical product, available in diamond wheels from many suppliers. Here are details of laboratory and field tests made by the first company to begin fabrication of diamond wheels with man-made diamonds. Plus a brief review of the failures and successes along the 129-year trail that made these diamonds a commercial reality.

A Special **Product Progress** Report

No. 470 March 23, 1959

1. How they grew

By John D Kennedy, manager, Diamond Section, Metallurgical Products Department, General Electric Company

Man has been attempting to break nature's monopoly on the know-how of diamond making since at least 1830. That's the year of the first recorded efforts at diamond making, which were unsuccessful.

Until the 1860's, the elusiveness of Mother Nature kept man on the wrong trail. The only known natural diamond deposits at that time were in India and they were alluvial in character, providing no insight on how diamond had been formed. These diamonds were washed by streams or carried long distances by glaciers from the areas in the earth where they were formed. Even today, the mother ground for those deposits is not known.

Nature's diamonds were discovered at the source in the 1860's in South Africa. The mother ground—often called blue ground—revealed evidence of the mechanism involved in their formation. This blue ground occurs in so-called "pipe" formations, roughly cylindrical columns of rock protruding through the earth's crust. It was believed that this rock was propelled in molten state from deep within the earth.

About 1880 came the completion of this geological theory: rock magma, forced upward from way below—an estimated 240 miles—passed through a strata of carbonaceous shale and became saturafed with carbon needed to form the diamond.

At almost the same time, James B Hannay, a Scotch scientist who had been working earnestly since the South African discoveries, announced he had achieved man's goal. He could make diamonds. His process involved heating a mixture of hydrocarbons, bone oil, and lithium to a red heat in sealed wrought iron tubes.

No one was permitted to witness the operation, probably for proprietary reasons, and certainly because of the menace to their lives. Many of the tubes exploded and only three of a total of eighty actually held. But his proof seemed conclusive because it listed a density of the material as 3.5, with a carbon analysis of 97.85 per cent. For many years hot discussions persisted about his claims but the 1902 Encyclopaedia Britannica concluded that his material was not actually diamond.

Next to make a similar claim (1920) was Henry Mois-

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American Machinist

1. How they grew . . .

san, a French experimenter, who utilized a process which involved dissolving pure sugar charcoal and molten iron and then immersing the iron in water to create high pressures and high temperatures.

The more modern attempts began in 1930 and one of the great contributors of knowledge in this field was Professor Percy W Bridgman, who achieved high pressures at temperatures up to 5000 F for very short periods of time. Following this work, General Electric scientists decided that diamond-making conditions were achievable.

The research group assigned to the job was successful in developing a comparatively simple apparatus which could sustain up to 100,000 atmospheres of pressure (1,470,000 psi) for long periods of time, and with the added capability of sustaining extremely high temperatures.

The group also came through on the second phase: a process for producing diamonds once the apparatus was developed. In February, 1955, the General Electric Research Laboratory announced the successful production of man-made diamonds by a reproducible process. By the most valid scientific tests—including x-ray diffraction, chemical examination, and hardness tests—the scientists proved the substance was truly diamond.

The Metallurgical Products Department in Detroit was assigned the task of determining whether man-made diamonds could be competitive with the natural product as an industrial abrasive—both in cost and in performance. Diamonds were a natural adjunct to our business of manufacturing cemented tungsten carbides and our plants were among the largest users of the diamond grinding wheels needed to shape these carbide products.

A project team was assigned to scale up the laboratory apparatus to produce enough diamonds for evaluation; the same team was to run field tests on abrasive products made with our diamonds. A considerable number of carats was made at truly fabulous costs. Results from laboratory equipment lapping tests in June-July, 1956, with 200 to 300 mesh diamond powder suggested the man-made product might be somewhat superior to the natural in lapping of hardened steel.

Then a grinding wheel manufacturer reported noticing something of significance in simultaneous, side-by-side grinding with a man-made and a natural diamond wheel. He observed that, in carbide grinding, a resinoid wheel with man-made diamonds consistently out-performed a similar natural wheel under a variety of infeeds, both wet and dry.

A pilot plant then was established to separate production activities from continued development. Our own production testing—primarily in General Electric plants—was finished in the fall of 1957 and on October 22 a press release told that the department was in pilot plant production on man-made diamonds of 60 mesh and finer particle size. Further announcements were slow to come because we had to be certain concerning every step. In April, 1958, a status report was made to industry.

Our first diamonds sold for $5.10 per carat. The latest price is $2.96 per carat—within about 6% of natural bort. In the past, diamond has been difficult to buy. There have been wide price fluctuations, also. These factors made industry wary of giving serious consideration to expansion of diamond abrasive uses. Now the day of the shortage of industrial diamond abrasive is past, but what we have seen still disturbs us. Some 70% of diamond bort consumed in the United States is used in grinding cemented carbides. Another 15% is divided between limited applications in the fields of stone sawing and glass grinding. So 85% covers a very narrow field.

Industry traditionally has been willing to spend money to explore new applications and reduce costs but this has not been so in the case of diamond. We are convinced the reasons lie simply in the history of limited availability and price instability. Now man-made industrial diamonds 60 mesh and finer are available in unlimited quantity.

If our findings are correct—that industry has shied away from the use of diamond for these reasons—then we say that the time has come for a complete reappraisal of the true value of diamond, a reappraisal based upon a thorough study and evaluation of what diamonds actually can do. Availability and price are no longer factors.

We at the Metallurgical Products Department are continuing development programs aimed at further cost reductions, improvement of crystal size and the development of specific crystal characteristics for the solution of specific application problems. However, we suggest that the study should be the combined effort of all industries who stand to gain. No single company can do a complete job.

Now the diamond product manufacturer should begin thinking in terms of new product designs and applications. Modifications and improvements in bonding methods may be an important factor in the application of diamond in new fields. Tool and abrasive engineers must point out the difficult abrasive problems and the new productive potential offered by an unlimited supply of diamond abrasive.

Summary of Tests

Reported in detail in Part 2

1. Man-made Diamonds—100 grit and finer—in Carborundum's laboratory and field tests consistently ranged substantially higher in wheel life than natural diamonds with comparable finish and less power per unit of carbide removed.

2. The full differential between man-made and natural diamonds is secured with lighter infeeds. To secure full and effective use of man-made diamonds, use them at infeeds consistent with their capacity to remove carbide.

3. Use man-made diamonds—100 grit and finer—in resinoid and vitrified bonds, but principally in resinoid bonds, on carbides.

4. Wet grinding is from 30 to 80% more efficient than dry grinding.

5. All diamond wheels tend to similar performance at heavy infeeds.

6. Although heavier infeeds reduce labor and burden cost, they increase abrasive cost substantially more.

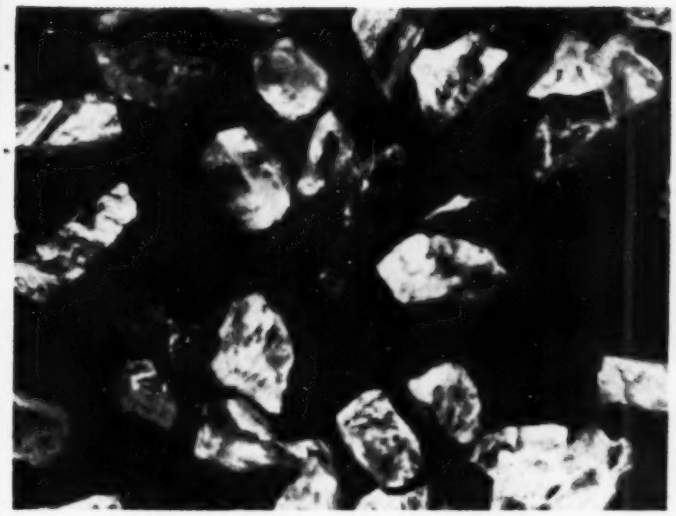


Fig 1 . . Natural crushed diamond bort

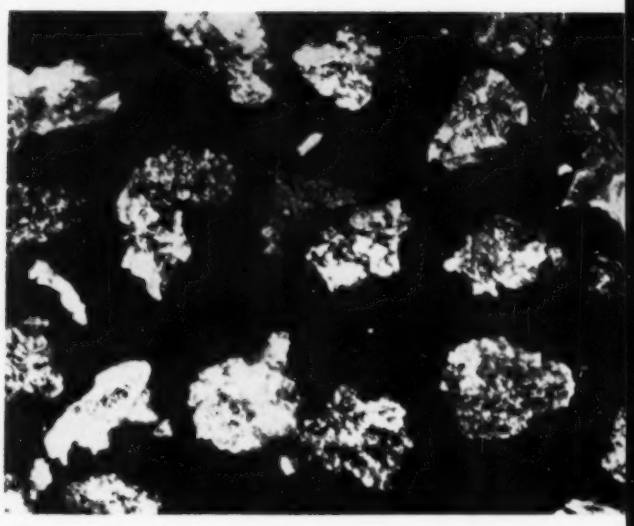


Fig 2 . . Man-made diamonds

2. Their status in the abrasive industry today

By **John Mueller**, manager, Grinding Laboratory, and

John Ripple, product manager, Diamond Products, Bonded Abrasives Division, The Carborundum Company

Shortly subsequent to GE's successful manufacture of diamonds, The Carborundum Co fabricated the first man-made diamond wheels and initiated a series of laboratory tests to compare the performance of man-made diamond and natural diamond wheels. Laboratory tests were followed by field tests. Here are our findings on the use of man-made diamonds for carbide grinding, together with some generalizations on the use of diamond wheels.

External Aspects

First, consider the external aspects of man-made diamonds and natural diamonds. Fig. 1 and 2 show natural and man-made diamonds respectively. There is a substantial difference in the peripheral characteristics of man-made diamonds and natural diamonds. The natural diamond has smooth flat surfaces, whereas man-made diamonds are rough and ragged with peaks and valleys.

From the point of view of abrasive technology, this difference is significant. A basic consideration in making abrasive products is the matter of bonding to hold the abrasive grain in position until it has done its abrasive job. The highly irregular surface of man-made diamonds allows the bonding agent to flow around the peaks and valleys, thus providing a more secure hold on the grain when it is under the stresses of the grinding operation.

Secondly, it was determined that man-made diamonds were more friable. Friability means breakdown and breakdown means cooler cutting. An abrasive wheel should be capable of gradual breakdown without spalling or shelling out the abrasive agent—diamonds. Fig. 3 and 4 show natural and man-made diamond wheels after use. The view is of the grinding area of the wheels after testing. A marked difference is noted. The dark areas are voids where the diamonds were torn out. The natural diamonds tore out more readily than man-made diamonds, and the relative grinding efficiency of the wheels was affected accordingly.

The natural diamonds, because of their smoother surface characteristics, were bonded less securely, and, therefore, tore out more quickly before their abrasive function was completed. The full capacity of the natural diamonds was not utilized, whereas the man-made diamonds were held more firmly and did a more efficient grinding job; that is, they were used up in actual cutting.

The wheels were resinoid-bonded diamond wheels. There are, in addition to resinoid wheels, vitrified and metal-bonded wheels.

The grinding performance of these wheels in general use has been as follows:

	Cutting Rate	*Life*
Metal bonded	Slowest	Longest
Vitrified		
Resinoid	Fastest	Shortest

The use of man-made diamonds in metal bonds did not show any appreciable advantage in laboratory tests. For the present consideration, we concentrated our efforts in resinoid-bonded applications where definite and measurable differences were produced.

Test Procedure

A typical resinoid-bonded flaring cup wheel, Fig. 5, was selected for the tests. Both the man-made diamond wheel and the natural diamond wheel were 150 grit with identical content and manufacturing method.

A cutter grinder was the machine chosen because tool and cutter wheels are the largest consumer of diamonds in the metalworking industries.

A carbide milling cutter was used with inserted pieces of tungsten carbide. There were 12 pieces, each measuring $^{3}/_{8} \times ^{3}/_{4}$ in. on the face. A definite infeed was taken on each piece; and after once around, we indexed 180° and went around again, continuing this procedure for the duration of the test.

A standard test consisted of 90 passes across each tooth at 0.0005 in. infeed. Thus, a total of 1080 pieces were ground at 0.0005 in. This was followed by 45 passes at 0.001 in. infeed, or a total of 540 pieces. Subsequently

2. Their status in the abrasive industry today . . .

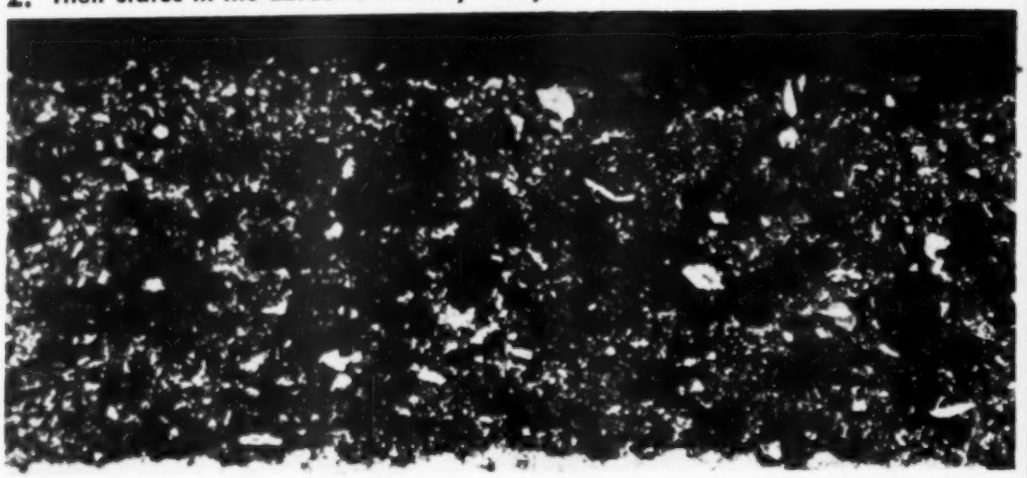


Fig 3 . . Face of natural diamond wheel after use

45 passes were made at 0.0015 in., and then passes at 0.002 in. infeed.

The tests were done wet and then repeated on a dry basis. Each wheel ground a total of 5400 pieces. This was of sufficient duration to warrant confidence in results. Exact records were maintained on metal removed, finish in microinches, power consumed, and wheel loss. Observations were recorded on burn on the carbide, and on the wheel, check, chatter, and any loading.

An indicator measured the amount of carbide ground. With this instrument each piece could be measured to 0.0001 in.

Fig 6 indicates the general arrangement of the tests and specifically the power meter to record power of grinding and Profilometer to measure finish. Of vital importance was the skilled operator with 14 years' experience in this exacting type of work. He knows his business and has a real understanding of the objectives and techniques of scientific testing of abrasives.

We measured wheel loss with an indicator to 0.0001 in. after each feed. A series of readings was taken around the wheel and then they were averaged. This arrangement also permitted us to check the wheel face and insure that it was in good running truth.

Laboratory Test Results

Fig. 7 indicates results of tests run on 150-grit N-grade resinoid-bond cup wheels, Type D11V9. (Subsequent references are also to resinoid-bond wheels.) Fig. 7 shows grinding ratio, finish, and power consumed at 0.0005 in. infeed on a wet grinding operation. The grinding ratio for man-made diamonds was 24, for natural diamonds, 14.6. This is an increase of 64%, which means that man-made diamonds ground 64% more pieces or 64% more carbide with the same diamond content. Finish was 21 and 19 microinches respectively, which is identical for all practical purposes. (Grinding ratio is the amount of carbide removed divided by the amount of wheel loss.)

Power increased with man-made diamonds because they were removing more carbide. It is pertinent to note that power increased only 16% while removing 64% more carbide. This means that man-made diamonds did not make the wheel act harder but increased wheel life without a corresponding generation of heat.

Normally we associate longer wheel life with harder wheels, more heat generated, and more tendency to check the carbide. Apparently this was not the case with man-made diamonds. They produced longer wheel life, more

Fig 5 . . Flaring cup wheel of man-made diamonds with resinoid bond—150-N100-B7-1/16

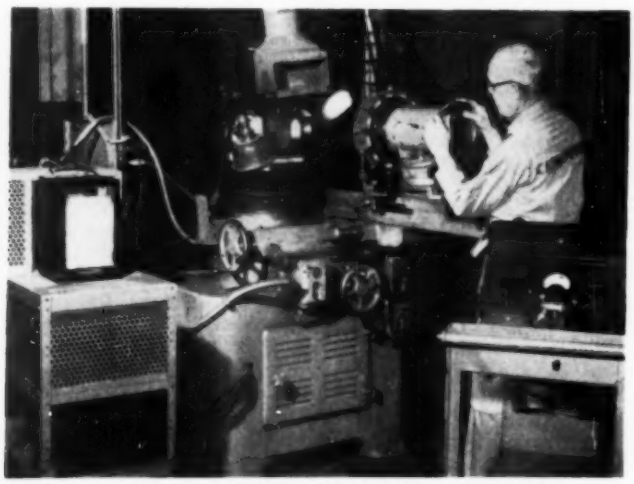


Fig 6 . . Laboratory test of diamond wheels with power meter at left of cutter grinder, Profilometer at right

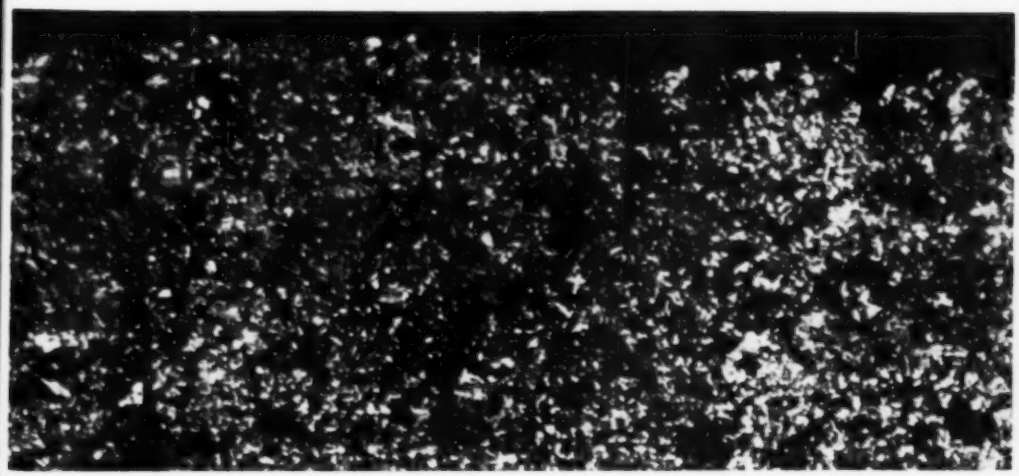


Fig 4 . . Face of man-made diamond wheel after use

pieces ground per diamond content, with equivalent finish, and less power than would normally be associated with the stock removal rate.

Man-made diamonds resulted in a freer cutting wheel with longer life. This is the direction in which abrasive engineers are constantly striving.

Fig. 8 indicates results on 0.0005 in. infeed with a dry operation. The man-made diamonds produced a ratio 15.7 while the natural-diamond ratio was 13.5, a 16% increase in life. Finish was equal and power was equal. The grinding ratios were lower than wet grinding. This is logical, as will be seen later. A definite trend was indicated in both wet and dry grinding. Metal removed was increased per unit of diamond content.

Fig. 9 indicates results with a heavier infeed—0.0015 in. per pass with a wet operation. The grinding ratios were substantially reduced 3.7 and 2.8 respectively for man-made vs natural diamonds. The man-made diamonds still show a 32% increase over the natural diamonds. Finish is again the same and power is about the same as in Fig. 7.

Fig. 10 shows the same infeed—0.0015 in. per pass on a dry operation. This operation shows man-made diamond and natural diamond performance to be equivalent. The operation was too severe, and the unfavorable grinding stresses overshadowed the difference in the wheels.

Many other tests were performed in addition to those discussed herein. All tests, however, substantially verify the data in this report. In general man-made diamonds in Carborundum's tests ranged 64% (some tests were 80%) more life than nautral diamonds and produced comparable finishes with less power consumption per unit of carbide removed.

Field Tests

Laboratory tests under precisely controlled conditions indicated the direction and magnitude of differences between man-made diamonds and natural diamonds in carbide grinding. The variable conditions of field operations substantiate laboratory findings.

Following is a tabulation of representative field tests: Field tests resulted in figures on increased wheel life

User	*Wheel Specifications*	*Comments*
Automotive Mfr.	D11V9, 3¾ x 1½ x 1¼ *MD150-N100-BR-1/16	Flaring cup, cutter grind. More than duble life. Freer cut. No loading, cooler work.
Tool Mfr.	D11V9, 3¾ x 1½ x 1¼ MD180-N100-B7-⅛	Flaring cup, cutter grind. More than double life.
Tool Mfr.	D1A1, 10 x ½ x 3 MD100-N100-B7-⅛	Surface grind. Much longer life. Outstanding for corner holding and free cutting.
Elecrtical Mfr.	D1A1R, 7 x ¼ x 1¼ MD180-N100-B7-1/16	Surface grind. Much better life. Free cut. Holds corner very well.
Automotive Parts	D11V9, 3¾ x 1½ x 1¼ MD100-N100-B7-⅛	Flaring cup, cutter grind. Double life. Extremely free cut.
Rotray File Mfr.	D1V1, 6 x ⅛ x ¼ MD180-R100-B-7-¼	Burr ginding. 50% more life. Held corner.
Rotray File Mfr.	D1V1, 6 x 3/32 x 1¼	Burr gninding. Average 75% more life.
Aircraft Mfr.	D11V9, 5 x 1¾ x 1¼ MD180-N50-B7-⅛	Flaring cup, cutter grind. 25% more life.
Carbide Mfr.	D6A2C, 6 x ¾ x 1¼ MD100-P100-V-⅛	Offhand grinding. Greatly extended life.

*MD denotes man-made diamond

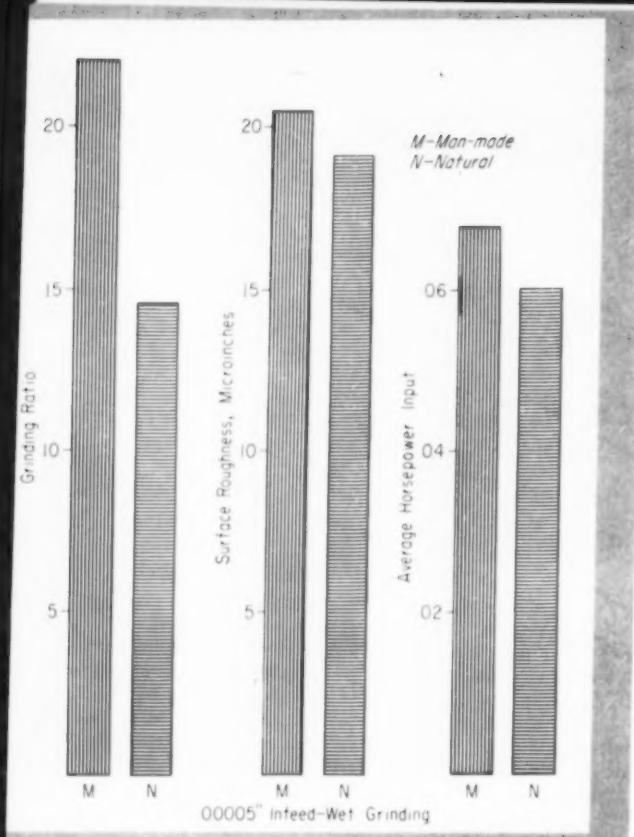
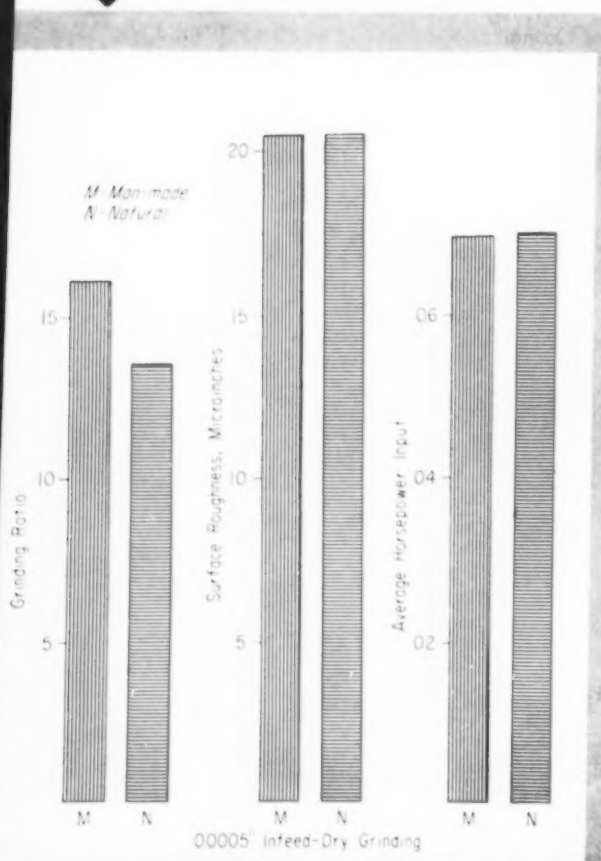


Fig 7 . . Test results with 150-grit, N-grade, resinoid-bond cup wheels at 0.0005 in. infeed, wet operation

Fig 8 . . Dry operation, other conditions same as for Fig. 7



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2. Their status in the abrasive industry today . . .

up to 100% for man-made diamonds. The average was 25 to 40% increase. Finish was comparable.

Our conclusion is that man-made diamonds are markedly superior to natural diamonds for carbide grinding in grit sizes 100 and finer, in resinoid and vitrified bonds, when used with proper light infeeds.

In addition, they are exceptionally free cutting and produce finishes comparable to natural diamonds.

Early laboratory tests indicated the strength and weakness of man-made diamonds in comparison with natural diamonds. We pursued their strong points—superior bonding characteristics and greater friability. The area of their competitive superiority at present is in carbide grinding, the greatest volume consumer of diamond abrasive products.

Man-made diamonds must await further engineering developments to be competitive with nautral diamonds for use in metal-bonded diamond wheels and for heavy-duty application such as in the stone trade and other applications requiring 80 or coarser grit.

In their present stage of development, man-made diamonds of 80 grit and coarser are aggregates or clusters of smaller diamonds. Under grinding stress the cluster breaks down into its component particles and therefore is not recommended at the present time. In metal-bonded diamond wheels and exception appears in electrolytic grinding of carbides where light pressures are used. Further tests are being made to amass a body of dependable data in this area and other metal-bond applications.

Reclamation of used diamonds is another consideration of importance to diamond wheel users, particularly those who have good salvage programs. Our information is limited on this. One of the leading reclaimers states that the sludge is much finer from man-made diamonds and therefore is of less value. They have little demand for the 320, 500, 800 and finer grits such as result from man-made diamond sludge.

An important offsetting consideration is that the man-made diamonds are retained longer in the wheel face and are used up in their original grinding application. The extent to which diamonds are recovered from sludge is in fact a measure of the inefficiency of the wheel and vice versa. No recovery means maximum original use.

Diamond Pointers

Proper infeed and the use of coolants are essential to efficient use of diamond abrasive wheels, whether they be man-made diamonds or natural diamonds.

Following is a comparison study of the grinding ratio of a soft J-grade diamond wheel as infeed was increased and as it was run dry and then wet.

Infeed per pass, in.	*Dry*	*Wet*	*% Increase Wet*
0.0005	15.1	27.0	79
0.001	6.2	9.0	45
0.0015	4.1	5.5	34
0.002	3.0	4.0	33

At the four different infeeds wet operation was respectively 79, 45, 34 and 33 per cent more efficient than

the dry operation. Simply by going wet, diamond cost can be substantially reduced. Wet grinding can be as a mist, a kerosene wick, a flood or other methods of introducing grinding fluids into the grinding area. The amount of grinding fluid at the point of contact will change the amount of difference in grinding action.

A more significant observation is that at 0.0005 in. infeed the increase of wet over dry grinding was 79%, while the incerase of wet over dry is only 33% at 0.002 in. infeed.

Following is a similar study of the performance of a harder L-grade diamond wheel:

Infeed per pass, in.	*Dry*	*Wet*	*% Increase Wet*
0.0005	19.0	37.3	96
0.001	7.6	9.7	28
0.0015	4.8	5.8	21
0.002	3.3	4.4	33

Thus the harder L-grade diamond wheel performance exaggereated the patter of the J-grade wheel. It was 96% mor efficient wet than dry at 0.0005 in. infeed and only 33% more efficient wet at 0.002 in. infeed.

It is significant that the difference between wet and dry grinding was greater with the hard wheel than with the soft wheel. Dry grinding with a hard-acting wheel accentuates heat generation and makes the diamonds spall out and tear away from the bond.

Following is a study showing the difference between grinding ratios of the harder and softer wheels run wet:

Infeed per pass, in.	*Softer J Grade*	*Harder L Grade*	*% L over J*
0.0005	27.0	37.3	38
0.001	9.0	9.7	8
0.0015	5.5	5.8	5
0.002	4.0	4.4	10

A similar study of a dry operation:

Infeed per pass, in.	*Softer J Grade*	*Harder L Grade*	*% L over J*
0.0005	15.1	19.0	26
0.001	6.2	7.6	23
0.0015	4.1	4.8	17
0.002	3.0	3.3	10

If we put all of these combinations together, we see in Fig. 11 that as infeed is increased all wheels tend to act the same until we have a difficult time determining any difference between them. The effect of grade is gradually minimized as infeed increases and the selective properties of the wheels are not used to greatest advantage.

In passing it should be pointed out that this is a basic principle in grinding, whether it be snagging, cut off, cylindrical, or internal grinding. It is not confined to diamond wheels—but in view of the cost of the diamond wheel it is especially important that the wheel be used with proper feeds and speeds and coolants.

Consider the following data relative to the importance of infeed, assuming 0.0005 in. infeed is 100% efficient.

	Harder L Grade		*Softer J Grade*	
Infeed per pass, in.	*Wet*	*Dry*	*Wet*	*Dry*
0.0005	100	100	100	100
0.001	26	40	33	41
0.0015	16	25	20	27
0.002	12	17	15	20

The foregoing data shows that heavy infeeds reduce

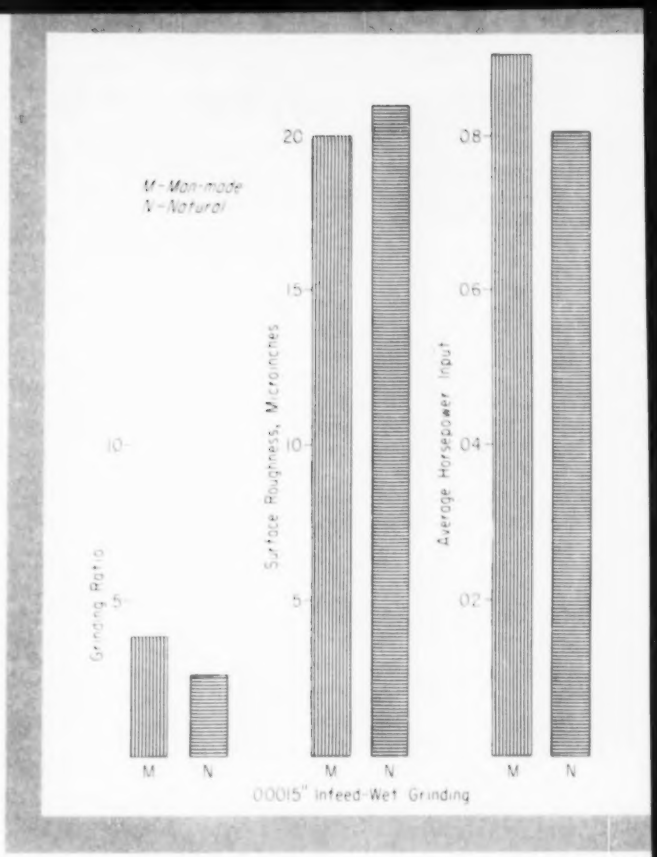
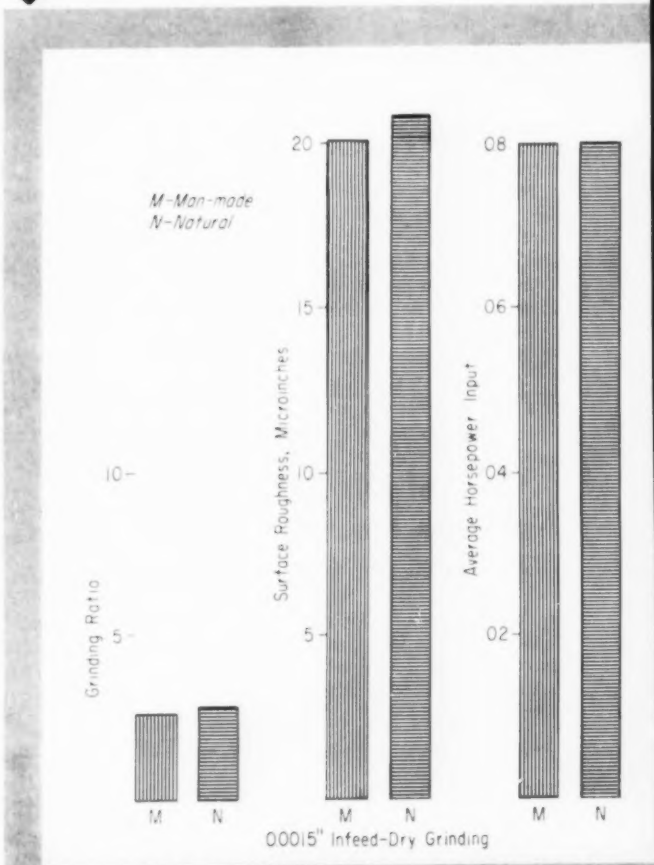


Fig 9 . . Infeed increased to 0.0015 in. with wet grinding

Fig 10 . . Dry grinding with the heavier infeed, 0.0015 in.



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2. Their status in the abrasive industry today . . .

the efficiency of the wheel to remove carbide up to 80%. For the user this means that at 0.002 in. infeed the wheels are used up 8 to 9 times faster than at 0.005 in. infeed. How much does this effect cost? The following tabulations indicate cost results for removing 1 cu. in. of carbide.

We have arbitrarily chosen a labor and burden rate; however, regardless of rate chosen the percentages will apply.

	Labor and Burden Cost		
Infeed per pass, in.	*Actual Cost*	*Percent*	*% Decrease*
0.0005	$6.47	100	—
0.001	5.25	81	19
0.0015	4.54	70	30
0.002	4.05	63	37

As the infeed increased the labor and burden cost decreased. However, this decrease in labor and burden cost is more than offset by the increase in abrasive cost as indicated in the following data:

	Abrasive Cost		
Infeed per pass, in.	*Actual Cost*	*Percent*	*% Increase*
0.0005	$9.99	100	—
0.001	38.43	385	285
0.0015	63.82	639	539
0.002	84.43	845	745

The increased abrasive cost at heavy infeeds greatly overshadows savings in labor-burden cost as graphically shown in Fig. 12.

Silicon carbide and aluminum oxide were under development for over a half century subsequent to their invention. Man-made diamonds, although proven in areas nidicated in this report, will undoubtedly be subject to further development in the diamond manufacturers' laboratories. Their use will be improved in abrasive companies' grinding laboratories. And of additional importance, users of diamond abrasive products will improve techniques for their most efficient application.

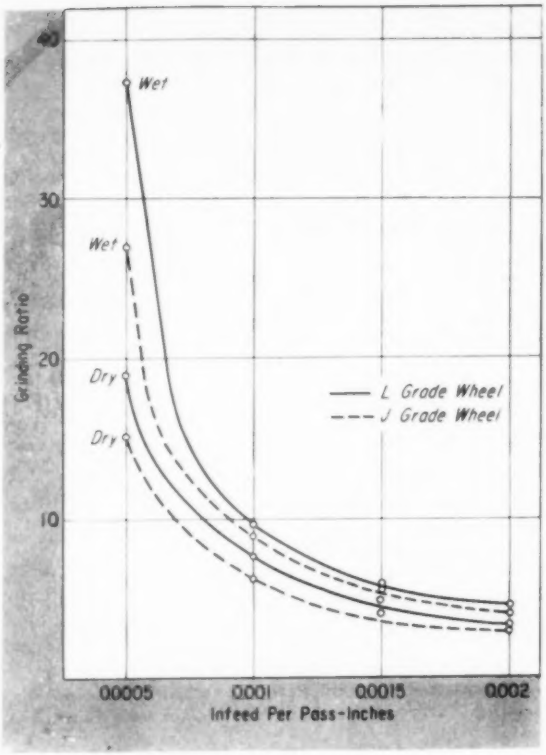

Fig 11 . . Effect of grade is minimized as infeed increases

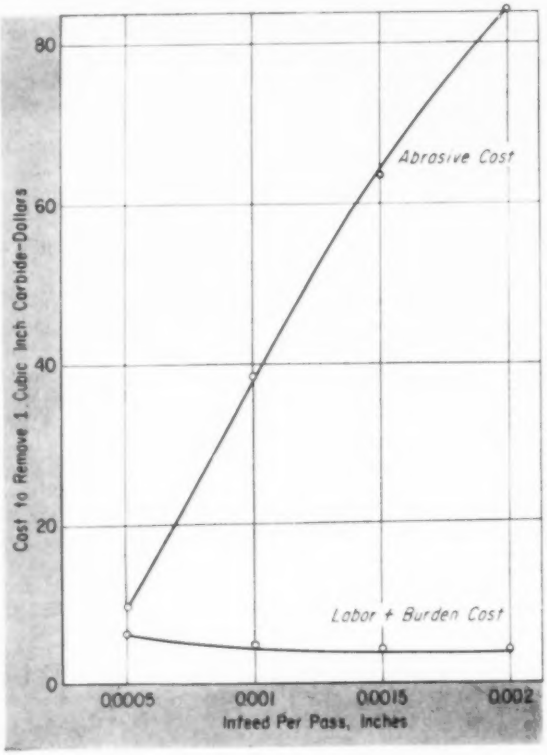

Fig 12 . . Increased abrasive cost at heavy infeeds overshadows savings in labor and burden

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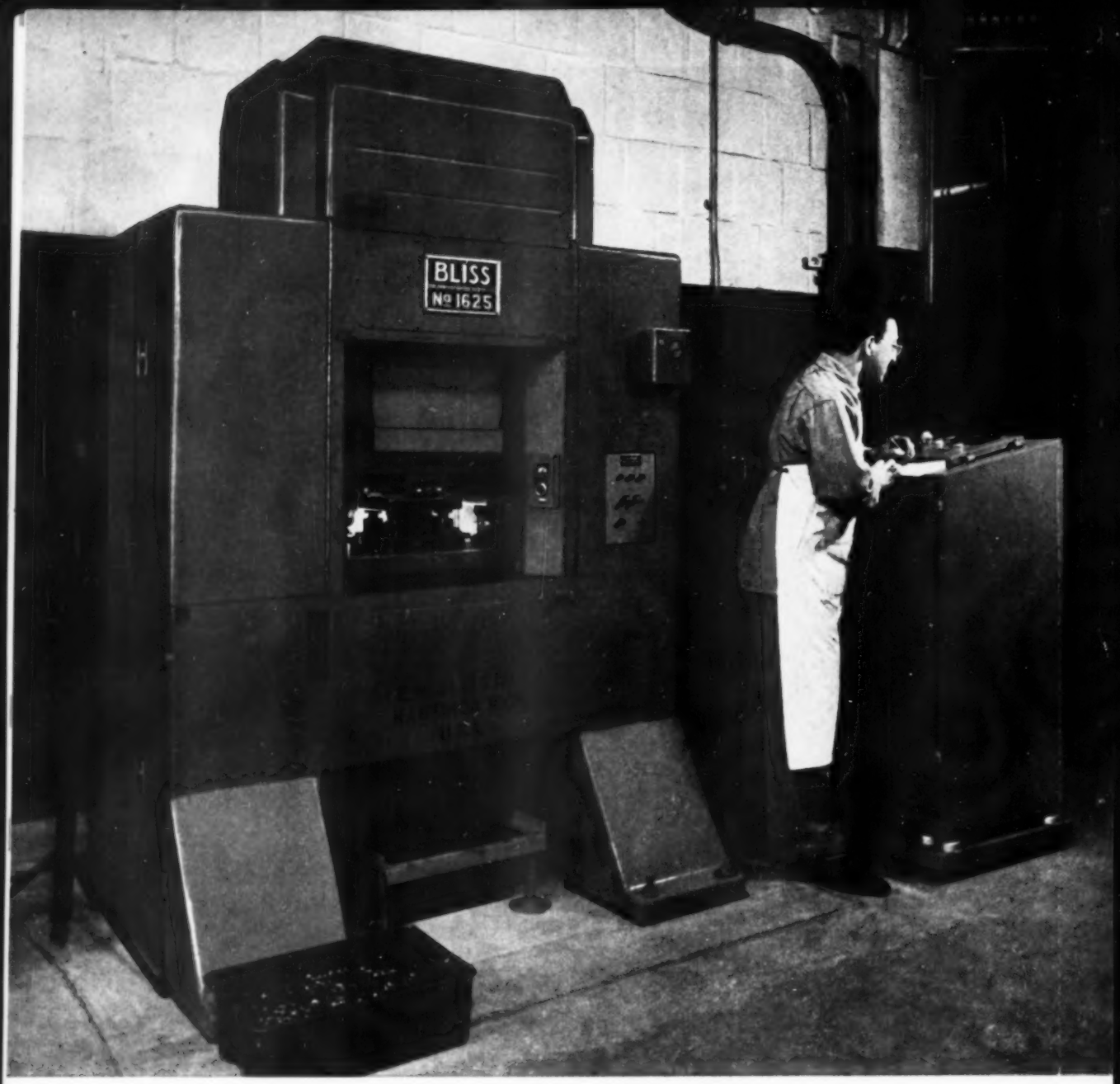

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Rate of Drill Penetration

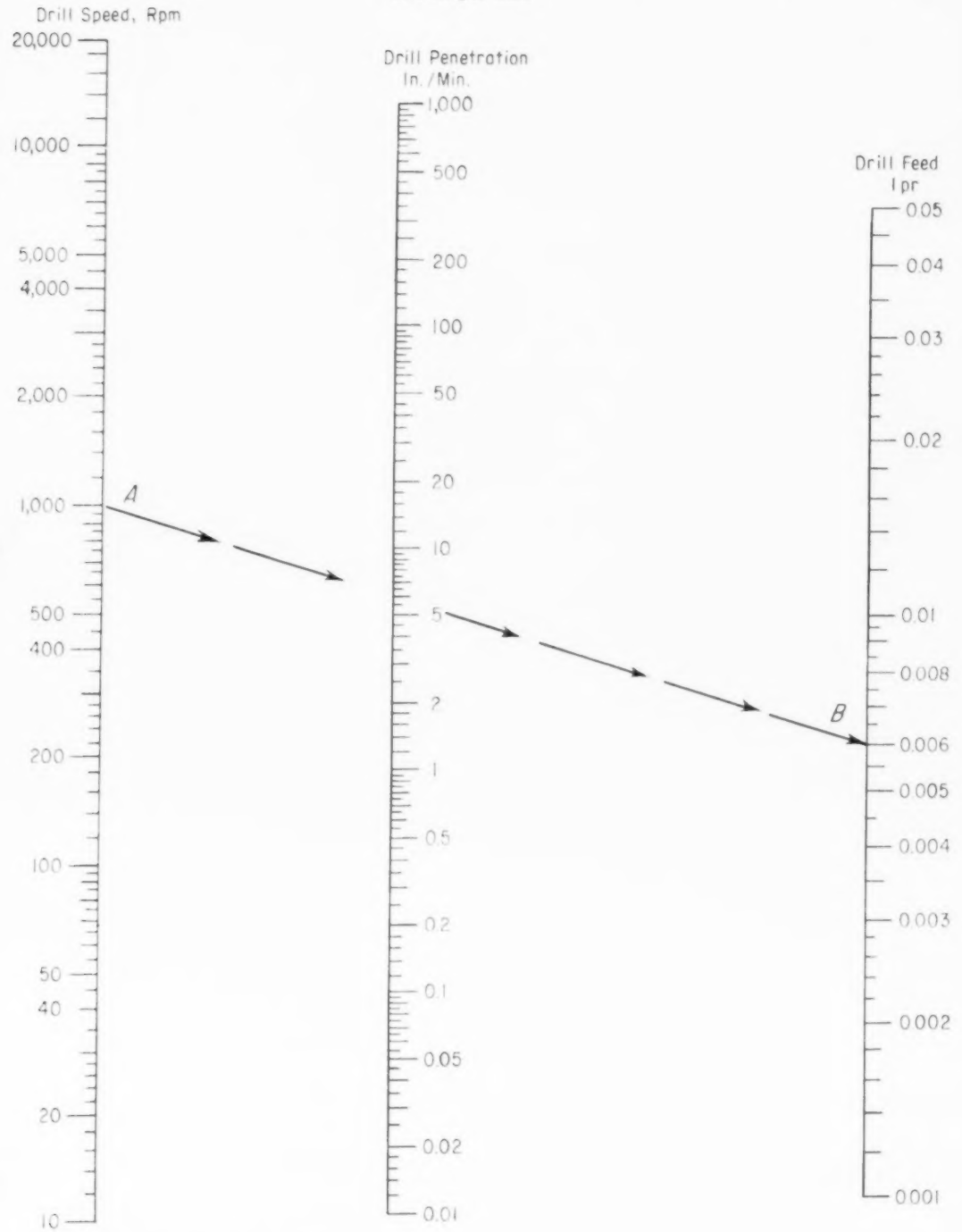
By Tyler G Hicks, mechanical engineer

$P = rf$

where P = drill-penetration rate, ipm
r = drill speed, rpm
f = drill feed, ipr

EXAMPLE: What is the drill-penetration rate, if drill speed is 1000 rpm and feed is 0.006 ipr?

SOLUTION: From 1000 at *A*, project to 0.006 at *B*. Where the construction line intersects the drill-penetration scale, read the rate as 6 in. per min.



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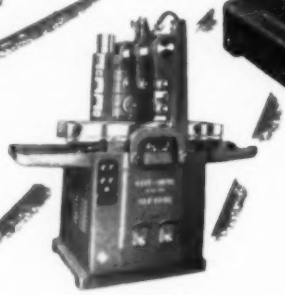

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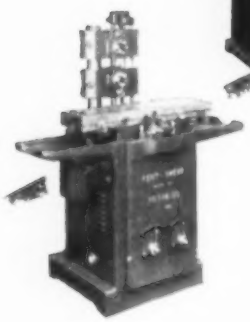

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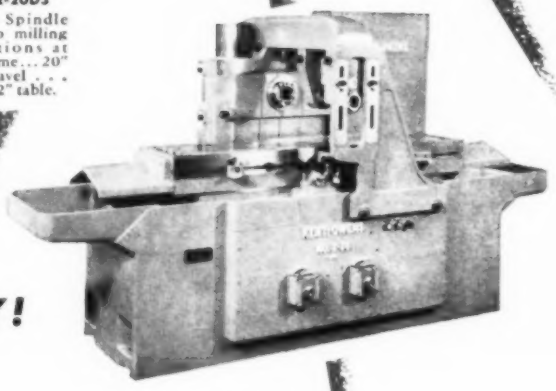

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Grinding L-Shaped Bevels

By Vincent E Califano,
equipment development, Electron Tube Div.
Radio Corporation of America, Harrison, N J

Two inner faces of an L-shaped workpiece can be beveled to the same angle, no matter what the angle is, by a one-setup method that involves double angles. This method eliminates tedious hand finishing that is often required to produce a clean intersection when the bevels are made at two setups.

The work is mounted on a surface-grinder table so one bevel surface is horizontal and the other is aligned accurately to a bevel-dressed wheel. Three angles are involved; A is the bevel angle, and is the angle to which the work is tilted from the table. B is a compensated angle to which the work must be twisted to bring the second bevel surface parallel to the direction of table travel. And C is the wheel-bevel angle, which is compensated for the back (B) angle.

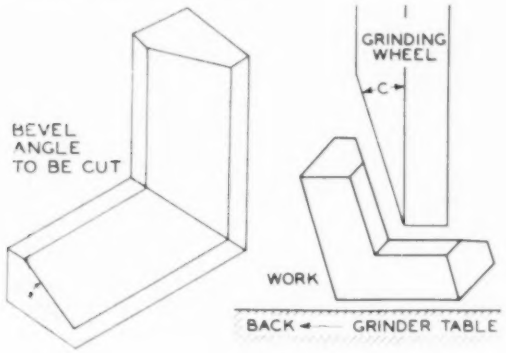
The work is held by any convenient method; sine bar, magnetic chuck, or a sine vise. The bottom bevel is ground first, with the back surface being generated as the wheel goes to depth against the work.

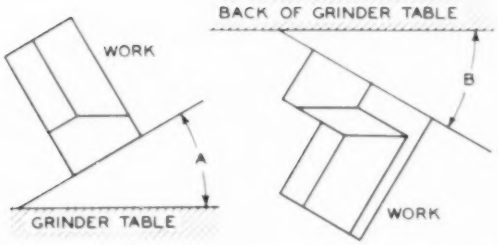
These angles can be calculated:

$$\text{Tan B} = \frac{\text{sine A}}{\text{cot A}}$$

$$\text{Cot C} = \frac{\text{cot A}}{\text{sin B}}$$

Values for B and C are given in the table. Values for B and C that correspond to fractional values of A can be interpolated or calculated.

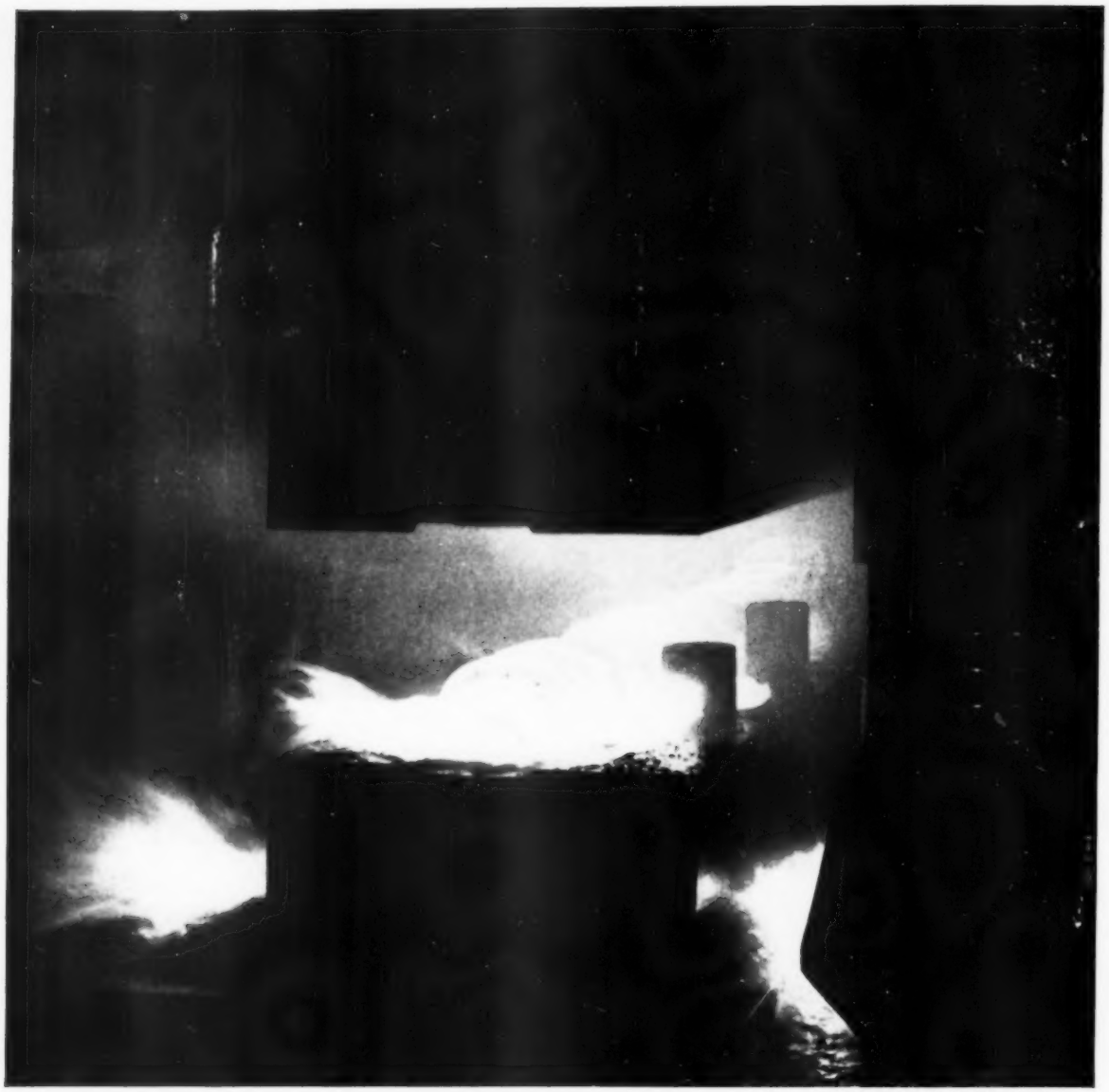




Bevel for an L-shaped part can be set up for any angle as long as both legs have the same bevel angle. Work is set up with one bevel face parallel to the table, the other parallel to the direction of table travel

Compound Bevel Angles for L-Shaped Parts

ANGLE "A"	ANGLE "B"		ANGLE "C"	
Degrees	Degrees	Minutes	Degrees	Minutes
1	1	0	0	1
2	1	59	0	4
3	2	59	0	9
4	3	59	0	17
5	4	59	0	26
6	5	58	0	38
7	6	57	0	51
8	7	55	1	6
9	8	53	1	24
10	9	51	1	44
11	10	48	2	5
12	11	44	2	28
13	12	40	2	55
14	13	36	3	21
15	14	30	3	50
16	15	25	4	21
17	16	18	4	54
18	17	10	5	28
19	18	2	6	4
20	18	53	6	43
21	19	43	7	22
22	20	32	8	3
23	21	21	8	47
24	22	8	9	30
25	22	55	10	19
26	23	40	11	4
27	24	25	11	53
28	25	9	12	42
29	25	52	13	35
30	26	34	14	29
31	27	17	15	23
32	27	55	16	18
33	28	35	17	15
34	29	13	18	13
35	29	50	19	11
36	30	27	20	11
37	31	2	21	14
38	31	37	22	16
39	32	11	23	19
40	32	44	24	24
41	33	16	25	29
42	33	47	26	35
43	34	9	27	37
44	34	47	28	50
45	35	16	30	0
46	35	44	31	10
47	36	11	32	19
48	36	36	33	30
49	37	3	34	44
50	37	27	35	55
51	37	51	37	7
52	38	14	38	20
53	38	36	39	35
54	38	59	40	53
55	39	20	42	7
56	39	40	43	24
57	39	59	44	57
58	40	18	45	57
59	40	36	47	15
60	40	54	48	34
61	41	10	49	54
62	41	26	51	10
63	41	42	52	32
64	41	57	53	52
65	42	11	55	13
66	42	25	56	33
67	42	38	57	54
68	42	50	59	14
69	43	2	60	38
70	43	13	61	59
71	43	24	63	23
72	43	34	64	43
73	43	43	66	8
74	43	52	67	30
75	44	1	68	58
76	44	8	70	17
77	44	15	71	40
78	44	22	73	5
79	44	28	74	29
80	44	34	75	53
81	44	39	77	19
82	44	43	78	42
83	44	47	80	7
84	44	51	81	31
85	44	55	82	55
86	44	56	84	20
87	44	58	85	44
88	44	59	87	10
89	44	59	88	35



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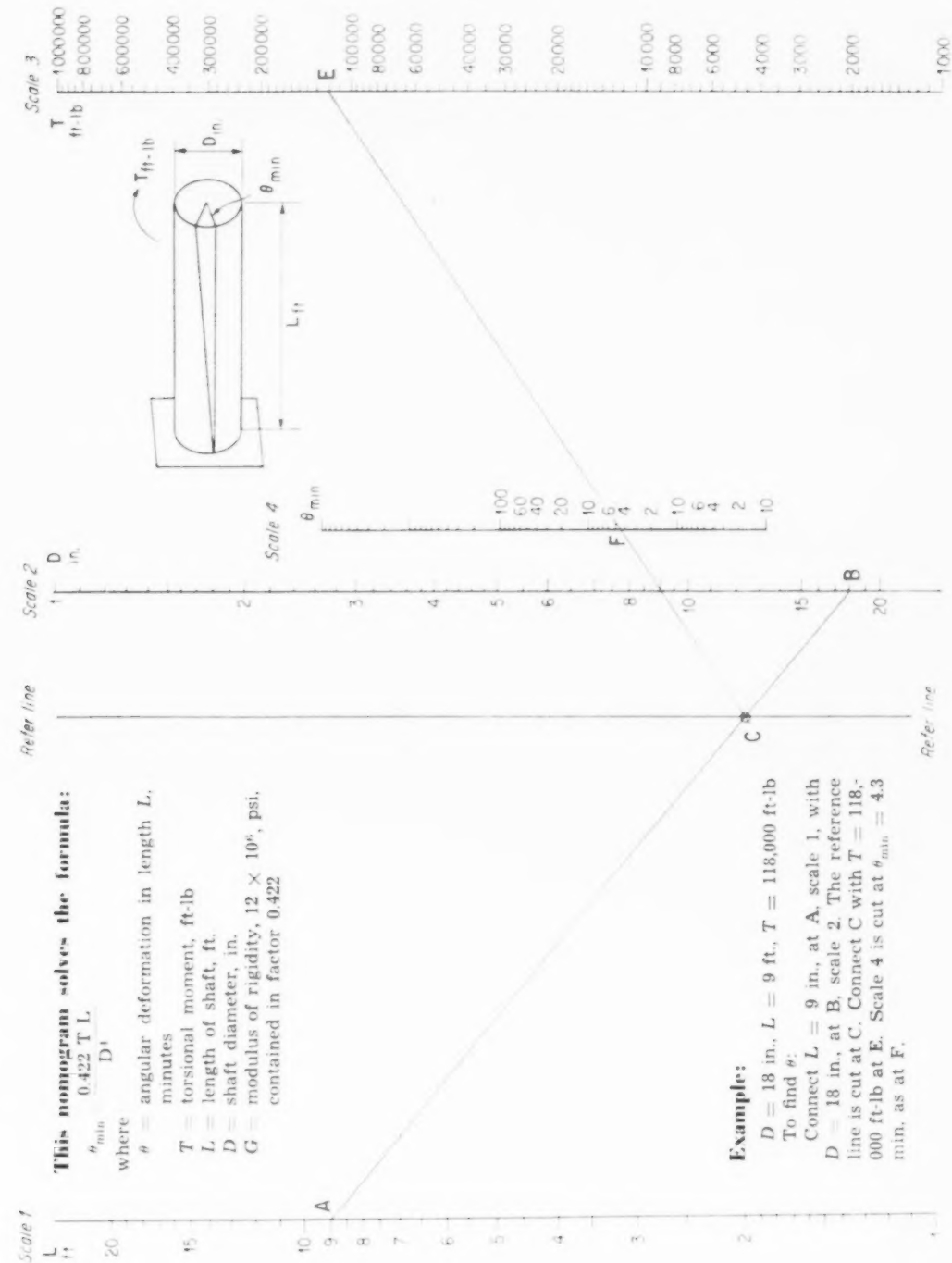
Twist Angle of Solid Shafts

By Michael M Lachowski, Registered Professional Engineer



This nomograph solves the formula:

$$\theta_{min} = \frac{0.422\ T\ L}{D^4}$$

where

θ = angular deformation in length L, minutes
T = torsional moment, ft-lb
L = length of shaft, ft.
D = shaft diameter, in.
G = modulus of rigidity, 12×10^6, psi, contained in factor 0.422

Example:

$D = 18$ in., $L = 9$ ft., $T = 118{,}000$ ft-lb

To find θ:

Connect $L = 9$ in., at A, scale 1, with $D = 18$ in., at B, scale 2. The reference line is cut at C. Connect C with $T = 118{,}000$ ft-lb at E. Scale 4 is cut at $\theta_{min} = 4.3$ min. as at F.

HARD GEAR HONING

CURRENT RESULTS

The following records are taken from current gear honing operations to show how some of the troublesome hazards of gear manufacturing are overcome by honing.

WHAT HONING ACCOMPLISHED

GEAR "A"

A lead error of .0008" was reduced to .0001"

GEAR "B"

Runout was improved .0020"

GEAR "C"

Notable improvement in both surface finish and in amount of tooth kickout

GEAR "D"

Variation in involute form improved .0002"

GEAR "E"

Size over pins reduced .004" and all nicks removed. Essentially a salvage job

THESE ARE THE GEARS BEING HONED

Gear	No. Teeth	Pitch Dia.	Rockwell "C"	Stock Removed	TIME	
					Honing	Floor to Floor
"A" INTERNAL	83	5.7832	58-63	.0015	40 sec.	70 sec.
"B" PLANET PINION	15	.790	56	.0005	27 sec.	31 sec.
"C" REAR SUN GEAR	45	2.3726	54	.0006	30 sec.	34 sec.
"D" REAR SUN GEAR	45	2.508	58	.001	24 sec.	30 sec.
"E" SPUR GEAR	46	6.000	60	.004		3 min. 25 sec.

NOTE: Hone Life, Gear "B"—6000 to 8500 pieces
Gear "C"—3000 to 4000 pieces

Write for Bulletin H-57-2

SPUR AND HELICAL GEAR SPECIALISTS
ORIGINATORS OF ROTARY SHAVING
GEAR HONING AND ELLIPTOID

NATIONAL BROACH & MACHINE CO.

5600 ST. JEAN • DETROIT 13, MICHIGAN

8098

WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

Talking Shop...

Family Skeleton

ONE OF OUR EDITORS recently became quite excited by a story he read in a magazine: The American Rocket Society, pre-eminent among today's space societies in age and membership, was founded, in 1930, in the house where he lives. He at once became convinced that the club had been founded in his apartment. At the time, his reasoning was quite cogent: There were only three apartments in the 130-year-old house, located in Manhattan only 20 blocks south of the McGraw-Hill building. Besides, he lives at street level on the most imposing floor of the house, in what once was the living room and dining room of a well-to-do 19th Century merchant.

A little spadework turned up a few surprises, and our editor has given up detective work forever. The Society, he found, was organized on the top floor of the house. And what had been located in his apartment? The answer, much to his dismay: A speakeasy!

Hot Skin

DESPITE THE TALK and experiment with hot-work tool steel for skins of hypersonic aircraft, the first plane to explore the fringes of space will probably be the X-15. Skin on the X-15 is made of Inconel X. The skin temperature is expected to reach 1200 F as it returns to earth from its 100-mile altitude.

Last Resort

THE OWNER of a small machine shop was out to lunch when a customer walked in with a blueprint and asked the young assistant whether his company could make the part for him. Knowing little about manufacturing problems, but unwilling to lose a possible order, the young man took a quick look at the drawing and said, "Oh yes, we'll make it; we'll send you a quotation in the morning."

When the boss returned he was horrified at the complexity of the job and, after studying the drawing for some time, called up the customer and said, "I'm sorry, that part is too difficult for us to make. In fact nobody can make it—you'll have to buy it."

Die Design Standardized

AT FRIDEN, a standardized drafting procedure on tool and die components has been adopted. The draftsman draws only the part that is special. Sections common to other tools or dies are not redrawn. Typical savings are said to run $120 on a single drawing, to add up to $223,000 for all of 1958.

Tough Irons

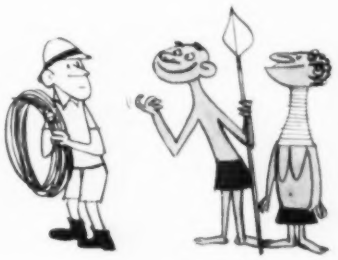
THOSE GOLFERS among you who shoot well enough to wear an iron out before you break it across your knee in the middle of a trap, hear this. The flame ceramics process, in which powdered ceramic is sprayed at 4000 F is being used on the face of MacGregor's irons to give longer wear. The process was developed at Armour Research Foundation to protect parts in rocket engines. Continental Coatings is applying it, under license, to the irons.

Classified

"DON'T EVEN TELL your wife," says a booklet issued by Vauxhall to employees of the British subsidiary of General Motors. What you shouldn't tell your wife is anything about the forthcoming new model. The booklet, titled "Careless Talk Costs Jobs," says that in the past loose talk has led to competitors copying new models before they were introduced. We suspect the wives may have something to say about this latest effort.

MEMOS

by BESS RITTER



It wasn't easy to install telegraph lines in Africa in the areas inhabited by the Masai tribes for this peculiar reason: The wires were such a high style feminine fashion that as soon as a line had been strung up, it was taken down and stolen by some native.

What made the situation even worse was that so much wire was considered necessary. No woman was content to wear a single necklace at a time. Instead, she insisted on coiling them from her throat down to her shoulders. Coils of wire from the shoulders to the elbows, from the elbows to the wrists, and from the ankles to the knees were even more modish.

The machinery which heated the rooms in the homes of the rich of ancient Rome was ingeniously devised. It consisted of a furnace that wasn't very different from modern American devices. Pipes—made out of tile instead of metal—conveyed the warmth from the furnace to designated chambers.

However, instead of installing radiators, the Romans dreamed up a different arrangement. They designed hollow areas beneath the floors, so that the hot air could circulate here. This penetrated through the flooring and kept the temperature comfortable. A method to which we have recently returned!

Practical Ideas...

Non-Parallel Work Supported on Molded Metallic Pads

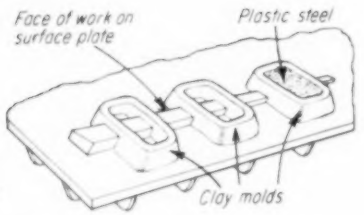


Fig 1

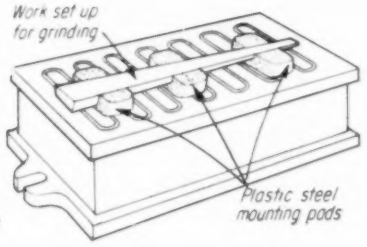


Fig 2

Surface grinding non-parallel pieces will usually involve a work-holding problem. When the surfaces are flat, though non-parallel, a universal-tilting chuck can often handle the job. But, if the angle of the two planes is compound, the problem becomes more difficult to handle.

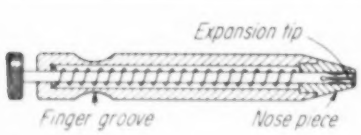
When we recently were confronted with this situation we found a simple solution in employing plastic steel to support the work. This material is a compound consisting of 80% steel particles suspended in liquid plastic, and is easily available in hardware or five-and-dime stores.

After coating all but the side to be ground with a parting agent (also produced by the makers of the plastic steel) the piece was placed with its uncoated face down on a surface plate. Molds were made of modeling clay and placed at intervals best suited to afford rigid support. See Fig. 1.

The molds were then filled with the plastic-steel compound, roughly leveled, and allowed to harden. After a few hours of hardening, the clay was peeled away and the piece with the pad adhering to it was transferred, workpiece still on the bottom, to the magnetic chuck on the surface grinder.

With the pads thus exposed, a few passes with the grinding wheel cleaned them up. The assembly was then turned over and the workpiece finished to size. See Fig. 2. The last step was to break away the pads, which was done with a few taps of a hammer.

John L Elliott, Birmingham, Mich



Tool Places Nuts On Hard-To-Reach Threads

Here is a tool that has saved us many aggravating moments. In our assembly department, it has simplified the job of reaching into tight places to start a nut on a thread.

The tool is used in the following way: The index finger and middle finger grip the tool in the groove machined on the OD. Pressure with the thumb on the knurled head of the stem projects its expanding end. A nut is then mounted on this end and introduced to the screw thread it is to enter. If the screw is stationary and the nut must be rotated, the knurled head is used to rotate the nut. Once the thread has caught, the pressure on the stem is released to retract it.

Machining the tool is easy. A rod long enough to reach the location in question is drilled out to receive the stem, and counter drilled for a compression spring. The large end of the bore is then machined to accept the nose end of the tool in either a pressed fit or a thread. Near the other end of the rod goes a radial groove as the finger grip.

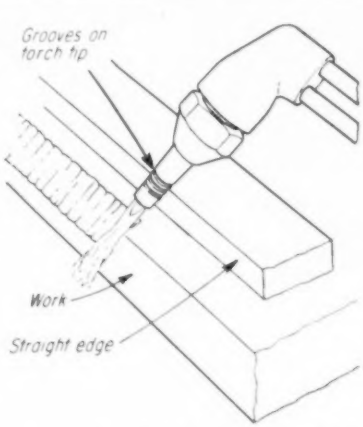
The stem is a length of drill rod, round nosed and slit in one end to form the spring-expanding tip, the diameter of which should be the same as the ID of the nut. The other end is fitted with a knurled head which is threaded onto the stem after assembly. A washer sweated to the stem serves as a stop, and a shoulder for the spring. The nose piece with a slide-fit bore for the stem is mounted and turned to a taper blending with the end of the rod.

N Tenoria, Buenos Aires, Argentina

Grooves on Torch Tip Give Operator Steady Hand

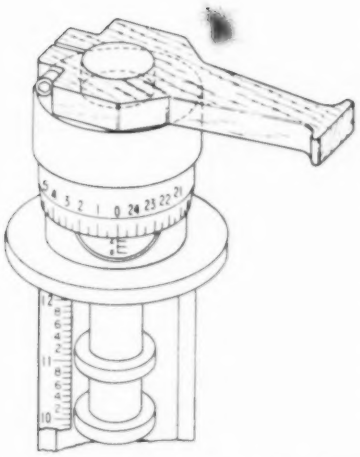
While a straightedge is a great help in torch cutting, the technique of maintaining the torch tip at proper distance from the work is not easily mastered. The end product definitely reflects the operator's skill in this respect as well as it shows his general knowledge of torch cutting.

One phase of the work, that of chamfering preparatory to arc welding, can be simplified by the trick shown. It involves the use of a series of grooves turned on the tapered OD of the tip. Riding on the corner of a straightedge, they maintain a constant distance between the tip and the work.



So prepared, all the operator has to do is to first place the straightedge at the proper distance from the work edge. He then, while holding the tip at the angle desired, selects the most suitable groove to brace and guide the torch.

Harvey Muller, Danboro, Penna



Handle Speeds Gage Changes

Inspection work performed on the surface plate has been greatly simplified with the Cadillac Pla-Check gage. With it, accurate heights from the face of the surface plate are quickly obtained and transferred to the work.

For those unfamiliar with this gage, since it is relatively new, let me explain further. Collars on its vertical column are machined with utmost accuracy to provide 1.000-in. steps over a 12 or 18-in. height. Adjustments are made by rotating a micrometer thimble at the top of the gage. Once it is set, the dimension is transferred to the work with an indicator-fitted height gage.

Though the most extreme changes take but 15-20 sec. to complete—that's when the column must be raised or lowered close to one inch—I still looked for a way to speed up this operation. The handle seen attached to the top of the thimble has reduced this time to less than 5 sec. It is made of hardwood so as not to mar or otherwise damage the gage. The handle is secured to the thimble by a screw across a slit running into the clamping bore.

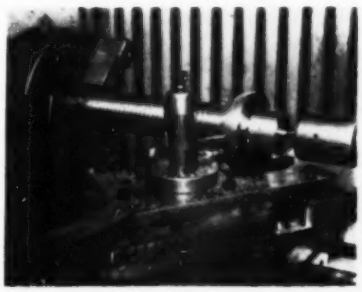
Joachim Janos, Vienna, Austria

Shop-Made Compound Produces Spherical Surface

We recently had to develop a prototype of a new tool in our shop. This involved some unusual machining operations, one of which was to turn a spherical surface on the head of a ball-joint pin. With proper equipment this would have been an easy job but, because our work was still in the experimental stage, the cost of such equipment was not justified.

Instead, I solved the problem by constructing a swivel compound which I mounted on the compound seat of the cross slide. It replaces the regular compound and rotates on the same swivel pin with two T-slot bolts keeping it in sliding contact with the seat.

The swivel compound is made up of 5 pieces of steel to a height equal to the original compound so the regular toolpost might be used. The bottom piece is a heavy plate machined



to fit the swivel pin. Bolt holes are drilled in recesses on either side for locking bolts. Two parallel bars and two flat bars are bolted to the bottom plate to form a T-slot for the toolpost.

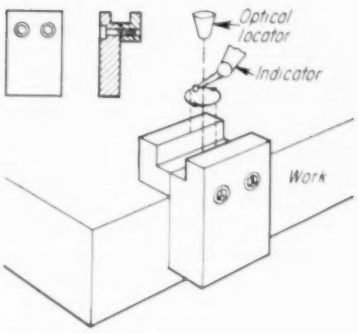
The desired radius is obtained by positioning the turning tool in relation to the axis of the swivel pin. A flat bar, bent at an angle and bolted across the back of the compound, provides a handle for rotating the tool.

Victor Bujold, Los Angeles, Calif

Dependable Edgefinder Is Inexpensive to Make

Here is a tool that should prove to be of great value to any operator of a jig borer, milling machine, or boring mill who starts his work by locating the edge of the workpiece. Yet, its cost is negligible; a few cents for material and less than two hours of spare working time is all that is required.

The edgefinder shown is made in two parts which are screwed together to form a gap equally divided



on either side of its mounting surface. When applied to the side of the work, a universal-dial indicator is used to center the machine spindle over the gap. Visual location of the work edge is also possible with a microscope sight focused on the finder's dividing line.

Any material capable of taking heat treating can be used in constructing the edgefinder, but to save machining time, we made ours of flat ground stock. After the two parts had been machined as shown, holes for two 6-32 socket-head capscrews are drilled in both. These are then tapped in the smaller piece, and counter bored in the larger. In the final grinding, the two faces touching each other in assembly and the inside faces of the indicator gap are all ground during the same setup to insure identical steps.

Karl Riebl, Franklin Square, L I

Tool Protection Tip

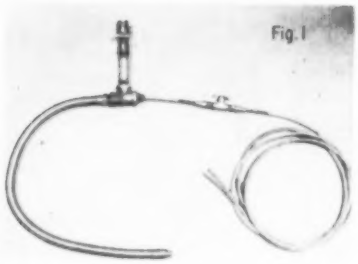
Instruments like micrometers, vernier and height gages, which generally have a polished finish, are subject to corrosion when handled by a person with "acid hands."

Since having had this problem personally, I've experimented in various ways to overcome it. The best, however, seems to be a light coat of oil. Evenly applied, it prevents oxydation by shutting out air at the same time as it affords lubrication to moving parts.

A small plastic sponge, lightly saturated with thin oil, serves well as an applicator. When not in use, it is kept clean in a tightly sealed glass jar.

R Miller, Lansing, Mich

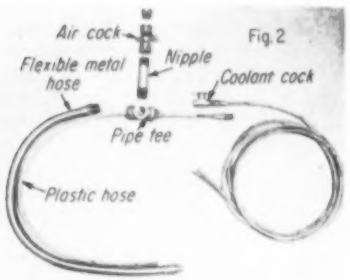
Practical Ideas...



Mist-Coolant Equipment is Simple and Efficient

Having heard of the effectiveness of mist coolant in machining operations, we decided to try it out. The equipment employed was completely shop made but proved very efficient and inexpensive to build. It can be used—as we did—siphoning from a coolant tank, or connected to a reservoir pump if the machine is so equipped.

Fig. 1 illustrates the assembled rig, less tank and mounting clamp. The photo below, Fig. 2, shows the



various parts which go to make it up. A standard flexible metal hose is screwed into one end of a $^3/_8$-in. pipe tee. At the opposite end of the tee goes a $^3/_8$-in. pipe plug which has been drilled up to receive a $^1/_4$-in. OD plastic hose in a snug fit.

Flow of coolant is controlled by a cock which is mounted between the supply line and the plastic hose by means of copper tubing and fittings. Air is piped into the side of the tee through a $^3/_8$-in.gas cock and nipple. A $^3/_8$ x $^1/_4$-in. reducing bushing permits direct airline connection with the shop air supply.

When siphoning from a tank, the plastic hose is pushed completely through the flexible metal hose. While the intake end of the coolant line is submerged, the air is turned on and the plastic hose is pulled back into the nozzle. Air and coolant are then controlled until the desired mist is achieved.

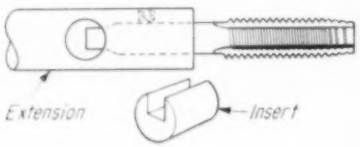
J M Askins, Lufkin, Texas

Type Cleaner Clears Files

Fine smoothing files, needle files, and other files having closely spaced teeth are difficult to clean after having been used on soft metals and plastics. A quick and thorough cleaning job can, however, be done with plastic type cleaner. This is a putty-like substance used by secretaries and typewriter maintenance men for clearing type.

After brushing the file to remove large particles, press the type cleaner firmly against the file's surface where it will penetrate into the teeth crevices. When the plastic is peeled off, the fine particles come out with it. The process is repeated in stubborn cases.

Harry Miller, Sarasota, Fla



It's Easy to Extend a Tap

During a recent job of machining a large casting, we experimented with various methods of extending a tap to reach hard-to-get-at places in the casting. The one found most successful and easiest to make was the tool shown.

For a $^1/_2$-in. tap we use piece of round bar stock of either $^3/_4$ or $^7/_8$ in. dia. A hole for the tap shank is drilled into the end of the bar to produce a snug wobble-free fit. At the end of this hole, a $^1/_2$-in. hole is drilled and reamed to receive a slotted plug.

We make plugs in quantity by milling a $^1/_4$ in. x $^1/_4$ in. slot in a length of drillrod; $^1/_4$ in. being the dimension across the flats of the squared end of our $^1/_2$ in. tap shanks. The rod is then cut into lengths equal to the diameter of the extension. Each piece is then hardened and drawn. This gives us a supply of plugs, ready when needed.

J G Gregory, Ilfracombe, N Devon, England

JOHN GREINER
Oceanside, LI, NY

$25 In addition to regular payment for his idea:

FORM GRINDING SETUP

in the Dec 29, 1958 issue

An extra $25 will be paid for the best Practical Idea in each issue of *American Machinist*. Selection of the winner is made by a group of our readers.

PAYMENT—$25 in addition to regular rates for the items published to be paid as soon as reader votes are received—usually three to four weeks after the date of issue. The winner will also be announced in these pages as soon thereafter as practicable.

JUDGES—A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in a tie, $25 will be paid to each co-winner. Decision of the readers will be final in each case.

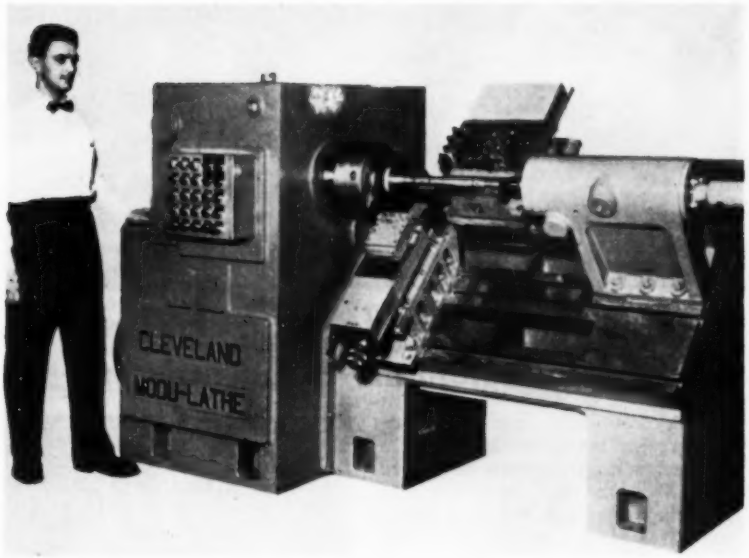
REQUIREMENTS—Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer, or author—every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product—in terms of its usefulness to them.

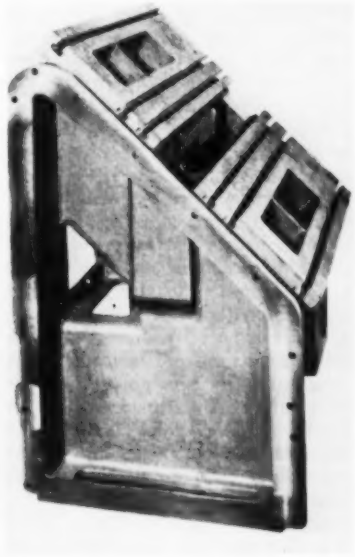
WHO MAY ENTER — Anyone may enter except employees of the McGraw-Hill Publishing Co, Inc, and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

HOW TO ENTER — Send all entries to "Practical Ideas Editor," American Machinist, 330 West 42nd St, New York 36, N.Y.

$100 GRAND PRIZE winner for the best Practical Idea in the 1959 Production Planbook was won by Hjalmar Dahl for his idea: Die Completes Part in One Operation.

New Shop Equipment
Materials and Parts





Modular Machines Offer Choice of 6 Headstocks, 4 Beds

In this line of modular turning machines made by Cleveland Hobbing and Machine Co, any one of six headstocks can be combined with any one of four beds and a variety of interchangeable components to create machines to exact production requirements.

The six headstocks, called the heart of the modular machine line, feature high-speed turning—up to 5000 rpm—and housing construction using high-tensile cast iron with 2-in. thickness in the major walls. They are available in 1, 2, 4, 8, 16, or infinitely variable speeds and a variety of ranges.

Beds range from the pedestal-type to the 68-in. model and are cast of high-tensile iron, steeply sloped for maximum chip roll-off and ease of tool adjustment. They are designed on the modified gap principle which permits machining of larger than usual diameters.

Using various combinations of headstocks, beds, and components, it is possible to create such machines as pedestal lathes, face profilers, pedestal chuckers, automatic chuckers and bar lathes, back-off lathes, turret lathes, twin lathes, production turning lathes, stub profilers, 20-in. profilers, threading lathes, qualifying lathes, and bar and chucking production lathes.

According to the manufacturer, this building block type of machine tool construction results in low investment for the purchaser because he may buy only what he needs when he needs it and it cannot become obsolete because components can be easily added or changed at any time in the future.

The capitalization cost of these modular turning machines is said to be very low because components in many models may be considered as tooling with possible advantages in depreciation or write-off.

Specifications include: a standard 30-in. swing over the entire bed, a feed range infinitely adjustable from 0 to 138 ipm, 2-in. dia maximum bar stock size with a standard spindle on the 3000 rpm headstock (3-in. with special spindle), and 1⅝-in. dia maximum bar stock size on the 5000 rpm headstock.

Cleveland Hobbing and Machine Co, Div of Textron, Inc, 1311 Chardon Rd, Cleveland 17, Ohio

MORE DATA? Circle 51, inside back cover

Tape-Control System Automates G&L Vertical Turret Lathe

This versatile, discrete positioning system for the company's vertical turret lathes (AM—Dec. 15 '58, p130) provides quick setup, faster operation between cuts, higher cutting speeds, and consistent high quality of the finished part. The tape system exercises complete control over

feeds, speeds, turret indexing, automatic dwell, and coolant supply, as well as all auxiliary functions the machine is capable of performing such, as cutting speed, thread cutting, drum scoring, taper cutting, and step turning.

In programming, movements of the heads and table can be coordinated so as to minimize cycle time and avoid mechanical interference. Head and ram motions can be programmed for simultaneous feed to permit moving tools at 45°. Rotation of power turrets can be controlled in either direction.

A unique innovation which makes the system more adaptable to general shop use is the override adjustment feature. The operator can add his information to the data system in the form of fine adjustments to either height or radius. Once such adjustments have been made, they automatically become part of the program. These adjustments may be made during setup or during operation. During long runs, the override control is used to compensate for tool wear.

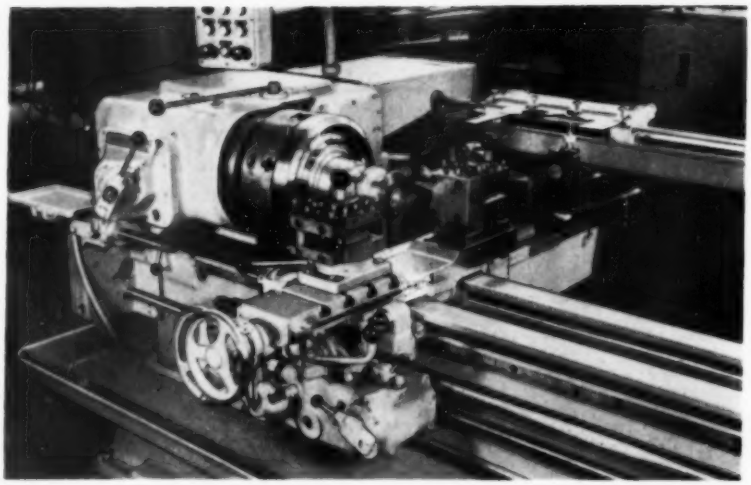
Only a standard 8-channel Flexowriter typewriter is needed to prepare the tape from the programmer's worksheet.

Giddings & Lewis Machine Tool Co, Kaukauna Div, Kaukauna, Wis

MORE DATA? Circle 52, inside back cover

ELECTROLYTIC CONVERSION SPINDLES can replace or convert existing spindles for electrolytic grinding on grinders or on cutting tools such as planers or milling machines. Electrolytic metal removal spindles are offered in various sizes and styles for operation up to 3000 amps—*The Cincinnati Electrical Tool Company, 355 Mt Hope Ave, Cincinnati 4, Ohio*

MORE DATA? Circle 53, inside back cover



Hydraulically Controlled Carriage Tracer Offers Four Automatic Tracing Cycles

This hydraulically controlled carriage tracer for turret lathes offers four automatic tracing cycles. It can trace through 180° of tool travel while turning, with the feed either toward or away from the headstock. It can also trace through 180° of tool travel while facing, with the feed either toward or away from the spindle center line. Roughing and finishing tools can be used in the indexing square turret.

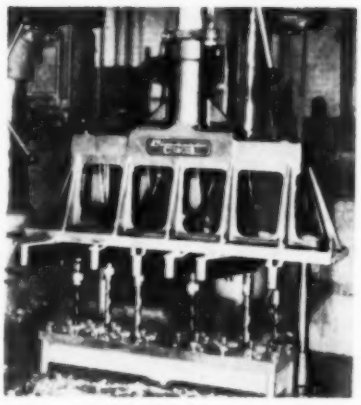
Complete size control for diameter is accomplished with the conventional, graduated handwheel, for either tracing or manual operations. This unit can also be used as a taper attachment and, with a suitable threading device, will produce tapered threads.

Mounted on the rear of the cross-slide carriage, the tracer does not interfere with normal operation of the square turret, the hex turret, or with tooling positioned at the rear of the cross-slide. Templets and stylus are clearly visible to the operator, and are out of the way of chips and coolant.

Feeds range from ½ to 18 ipm, and can be changed even while machining. Turning capacity of the tracer is the same as the mechanical capacity of the machine in 20-in. increments. Facing capacity in either turning and facing cycles is up to 6-in. radius change. This tracer is available on the No. 7 saddle-type machines and, with removal of the ram saddle, on ram-type lathes.

Jones & Lamson Machine Co, Springfield, Vt

MORE DATA? Circle 54, inside back cover



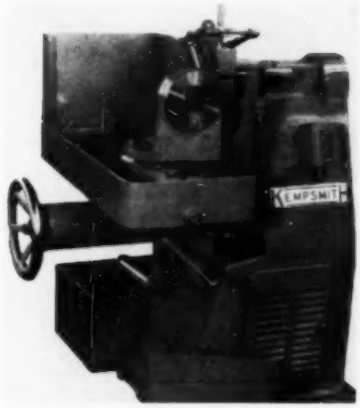
Drillhead Fits Any Drillpress, Carries Up to 15 Spindles

This Model 3-22 Multi-Drill with two to 15 spindles has a drilling area of 3 x 22 in., but can be extended up to 35½ in. with standard extension spindles. Designed for use on any drillpress, this unit is equipped with universally adjustable locating arms, heavy-duty universal joints, and antifriction bearings.

Maximum capacity is ⅜ in. in steel. Minimum center distance is ½ in. The unit may be used for multiple tapping with the addition of a Commander motor reversing unit. For simultaneous tapping of threads of different pitch, the company can supply pitch-compensating spindle assemblies.

Commander Mfg Co, 4225 W Kinzie St, Chicago, Ill

MORE DATA? Circle 55, inside back cover



Low-Cost Machine Grinds Up to 1500 Tool Bits Per Day

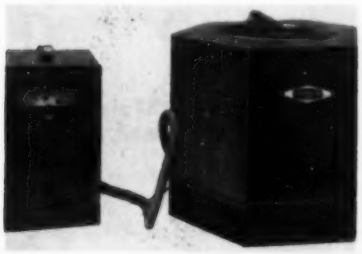
This heavy-duty low cost production tool grinder is reported by the manufacturer to have regularly ground 1300 to 1500 tool bits per day with relatively low skilled operators. Tool bits ranged in size from ⅜ in. by ¾ in. to 1 in. by 2 in. and the stock removed varied from ⅛ in. to ⅝ in.

Driven by a 3 hp motor via a V-belt, the spindle of this grinder is mounted on three bearings in front and a double bearing in the rear. Tool bits are held in a double swivel right angle holder mounted on a cradle which pivots on a large steel guide.

The cradle is arranged for hand rocking but power rocking is also available. With minor modifications the machine can be used for production face milling of small non-ferrous metal parts.

Kempsmith Machine Co, Milwaukee 14, Wis

MORE DATA? Circle 56, inside back cover



Versatile Electric Furnace Designed for Lab or Shop Use

Type 2100 Thermolyne furnace is a top-loading, multi-purpose unit, adaptable for use as salt bath, melting, vertical muffle, or crucible furnace.

This electric furnace can be used for investigative and pilot runs as well as short run production and heat treating small parts.

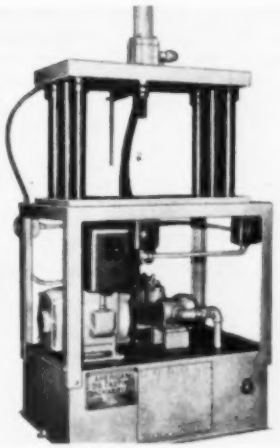
The basic unit includes the hexagonal furnace, stainless steel pot with cover and lifting handle, and thermocouple in protection tube. Furnace operates on 115 or 230 v and chamber measures 6⅝-in. dia by 11½-in. deep. Pot measures 6½-in. dia by 7½-in. deep.

The furnace case is of heavy gauge welded and braced steel construction and the heating coils are made of heavy gauge nickel chromium.

Optional accessories include refractory ladle, refractory chamber liner, insulated cover. Both manual and automatic controls are available. Cost of the basic unit is $180.

Thermo Electric Mfg Co, 461 Huff St, Dubuque, Iowa

MORE DATA? Circle 57, inside back cover



High-Speed Die Trim Press Has Self-Contained Hydraulic System

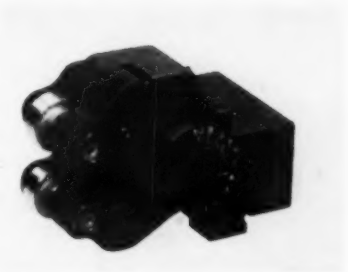
This high-speed, hydraulic trimming press, designed specifically for the die-casting industry, is reported to be the lowest priced, precision-built trimming press on the market. Its most outstanding feature is its self-contained hydraulic system. The entire platen area can be utilized to its fullest extent, and the 4-post die set offers rigidity and uniformity in the trimming of flash.

Other features include simple adjustment of die height, double push-button operation, electrically operated solenoid controls. Platen sizes start at 14 x 30 in.

The press illustrated, Model 1000, is 23 in. wide, 33 in. long, and 70 in. high.

American Die Casting Machinery Co, 1744 W Winona St, Chicago 40, Ill

MORE DATA? Circle 58, inside back cover



Reed Thread Rolling Attachment Fits Smaller Automatics

The Model B5 thread rolling attachment is designed for use on the smaller automatic screw machines, where the larger Series B attachments are not suitable. This particular unit (illustrated) is for the No. 00 B&S automatic, has a 0 to 5/16-in. stock capacity and a maximum thread length of ½ in.

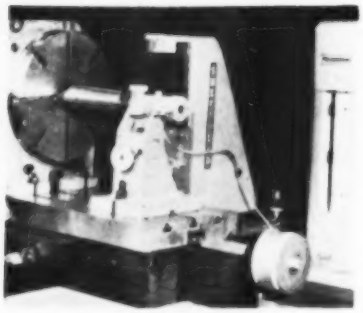
Like other Series B attachments, the B5 is adjustable and self compensating. Two-roll design assures lower pressures on the machine spindle.

Reed Rolled Thread Die Co, 791 Main St, Holden, Mass

MORE DATA? Circle 59, inside back cover

ROTOR-LAMINATION PRESS, 100-ton capacity, produces finished rotor laminations at a rate up to 300 per minute—almost three times as fast as ever before. Blanks, previously stamped from strip or sheet, are fed to this press where they repunched. The press feeder, called a Fingerflex Feeder, provids positive control over feeding and ejection—*Precision Welder & Flexopress Corp, Cincinnati, Ohio*

MORE DATA? Circle 60, inside back cover



Machine Inspects 3-D Cams, Irregularly Shaped Parts

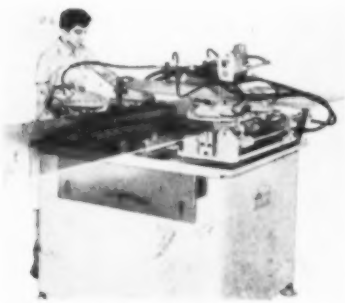
Three-dimensional cams up to 3 in. radius and 6 in. long and other irregularly shaped parts can be inspected on the Precisionaire measuring machine.

The machine, which occupies bench space of 32 by 26 in., features: high amplification reference indicator for locating cam datum points precisely, 4-in. barrel micrometers for setting radial and axial movements, rotary table to establish the angular coordinate of the cam, and longitudinal slide mounted on free-moving balls.

Radial and axial movements can be made to an accuracy of 0.00001 in. and angular position to within ±6 seconds of arc throughout 360 degrees.

Sheffield Corp, Dayton 1, Ohio

MORE DATA? Circle 61, inside back cover



Double Air Feed for Presses Handles 60-in.-Wide Materials

New Ses-Matic feed for presses or shears is built in sizes to handle materials up to 36, 48, and 60 in. wide. It can feed from any side of a press, and can be easily moved from one unit to another. Only tie-in to the machine necessary is the mounting of a limit switch in such a manner that it is tripped on the up stroke of of the press; this energizes a solenoid-operated valve which in turn cycles the feed. Unit is anchored to the press by a bar across the front of its fabricated base.

Ses-Matic non-powered stock levellers, available as optional equipment on the feed, remove coil curvature from mild steel. They mount directly behind the feed and use its power to pull stock through rolls.

Special Engineering Service, Inc, 8161 Livernois Ave, Detroit 4, Mich

MORE DATA? Circle 62, inside back cover

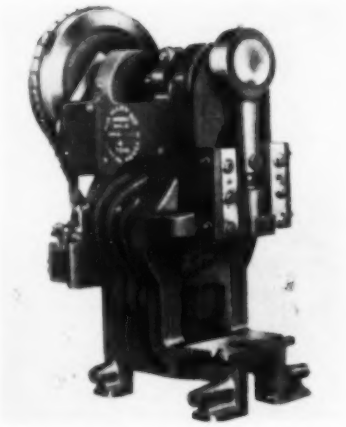
Aluminum Bars Available For Machining into Bearings

Bearing aluminum bars, using Alcoa B-750-T5, are now available for machining to fit any bearing use. The bar is an aluminum-tin alloy with copper, nickel and magnesium added.

As a sleeve bearing material it possesses the qualities of good heat conductivity, excellent embedability, good ductility, high load carrying capacity, high resistance to corrosion, conformability to the shaft and good fatigue strength.

Bunting Brass and Bronze Co, 724-30 Spencer St, Toledo 1, Ohio

MORE DATA? Circle 63, inside back cover



4-Ton Bench-Type Punch Press Features Frame-Inclosed Motor

Model BM-4, a 4-ton bench-type punch press, is a compactly designed unit with the 1/3 hp motor encased in the frame casting. Dimensions are 10⅝ in. wide by 17½ in. deep by 24⅝ in. high.

Press is controlled by solenoid operated clutch, single-pin, knife-type, and can be adjusted for either continuous or single-stroke action.

Die space is 6½ in. open height

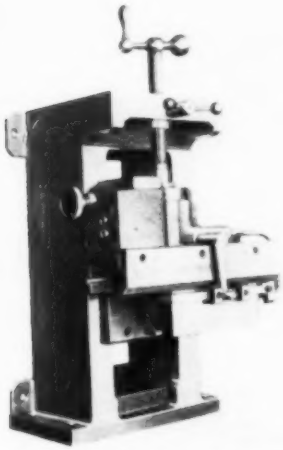
AUTOMATIC CUTTER GRINDER sharpens a wide range of milling cutters. It grinds on the OD as well as the face and bevel of any cutter within its 4 to 20-in. dia capacity, and spin-grinds newly filled cutters to size. Spindle speed is automatically increased to compensate for wheel wear, and the wheel is dressed with every stroke. A single operator is said to be able to handle more than one of the automatic machines—*Ingersoll Milling Machine Co, Rockford, Ill*

MORE DATA? Circle 64, inside back cover

and 4 in. throat space. Standard stroke is 1 in. with strokes of ¼ in. to 1½ in. also available. Press ready for operation sells for $299, FOB Clinton, Mo.

Alva Allen Industries, Punch Press Div, 1001-15 N 3rd St, Clinton, Mo

MORE DATA? Circle 65, inside back cover



Hydraulic Roll Marking Machine Can Be Mounted in Any Position

The No. 58U is a standard, packaged unit for hydraulic roll marking. It is available with or without hydraulic power unit, and is also available as the No. 58, incorporating the 58U on a standard base.

This universal marker can be mounted right side up (illustrated), upside down, sideways, or at any angle, in any location. Mounting space is only 1 sq ft.

Specifications include a slide travel of ¼ to 3½ in.; head travel of 0 to ½ in.; maximum pressure of 8000 lb; unlimited die space; 4-in. head adjustment; slide speed of 50 1-in. strokes per min; and a marking capacity of 7 lines of 1/16-in. characters, 4 lines of ⅛-in. characters or 2 lines of ¼-in. characters.

Cadillac Stamp Co, 17315 Ryan Rd Detroit 12, Mich

MORE DATA? Circle 66, inside back cover

Control System Adapts to Any High-Speed, Multiple-Die Press

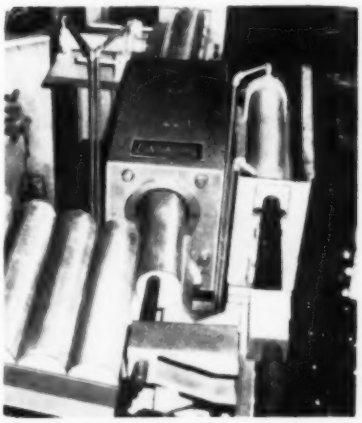
Adaptable to all types of high-speed, multiple-die presses, this simultaneous position detector supplies fail-safe control at speeds beyond the monitoring capacity of operators or conventional automatic control methods. The system was designed originally for a can-forming operation but can be adapted for any press having as few as two dies or as many as 25 or more.

The detector is a relatively simple fail-safe pulse system, either photoelectrically or magnetically operated, in which phasing determines accuracy or inaccuracy. It differs from other systems in that it requires each stroke of the press to prove proper operation of both press and control. Any malfunction of either press or control causes immediate shutdown.

The can-forming machinery was a multiple-die press that stamped out can ends from tin plate fed automatically into the die area. The detector had to register the ejection of all can ends formed by each stroke of the machine. This is but a single application of this detector. Its flexibility makes it adaptable to manufacturing processes using other types of automatic equipment.

Sterns Control Corp, 220 E Shore Rd, Great Neck, NY

MORE DATA? Circle 67, inside back cover



Heater Brings Aluminum Billets To Exact Extrusion Temperature

This induction billet heater provides an improved control system for accurately heating aluminum billets to exact temperature for extrusion. The exclusive "Metered BTU's" system measures watt-hour input to the billet with an integrating watt-hour meter and determines, with a totalizing meter, the amount of energy absorbed by the billet. A means of compensating for the initial temperature of the billets is provided. No prod-type thermocouple (with its inherent inaccuracy and maintenance) is required.

With low-voltage power sources, smooth stepless power control can be obtained through saturable reactors. This eliminates high contactor maintenance cost as well as providing control fo billet heating rate.

Lindberg Engineering Co, High Frequency Heating Div, 2444 W Hubbard St, Chicago 12, Ill

MORE DATA? Circle 68, inside back cover

Two Horizontal Press Unloaders Added to Sahlin Equipment Line

Two small horizontal press unloaders —one with a 14 ½-in. stroke, the other with a 16½-in. storke—have been added to the Sahlin line of press automation equipment.

The unloaders can be used on a variety of press types and in many different applications. One 14 ½-in. unit is being used to remove scrap from the inside die area of a press and a 16½ in. unit with 3-in. lift is being used to unload the second stage of a two-stage die.

Jaw components are interchangeable with the manufacturer's standard line of jaws.

Sahlin Engineering Co, Inc, Birmingham, Mich

MORE DATA? Circle 69, inside back cover

SPROCKET ASSEMBLIES called Selecta-Bore are available in over 600 possible pitch, teeth and bore size combinations. All sprocket requirements can be made by assembling interchangeable plates and hubs— *Whitney Chain Co, 237 Hamilton St, Hartford 2, Conn*

MORE DATA? Circle 70, inside back cover

Electroluminescent Readout Lamps Display Numerical, Verbal Data

These electroluminescent readout lamps are thin, flat, light-emitting plates about the size of a playing card, which display all numerals from 0 through 9, all letters of the alphabet, and selected symbols. Rated for 240 or 440 volts and 60 to 400 cycles, the lamps require almost no power input—less than 0.2 watt for the largest lamp.

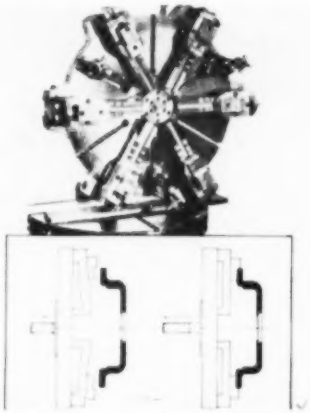
Since electroluminescent light is directly produced by action of an alternating field on a film of phosphor, the units are not dependent on a filament or gas, or on mechanical linkages. As solid-state devices the lamps age but do not fail. New lamps can be plugged in whenever intensity falls to an inadequate level after the rated life of 3000 hr.

Two forms of lamps are now available. Alpha lamps register all letters, numerals from 0 through 9, plus and minus signs, and many symbols. Numeric lamps register 16 letters, numerals 0 through 9, and plus and minus signs.

Applications include "scale-and-pointer" use for measurement and instrumentation, information display boards.

Westinghouse Electric Corp, Pittsburgh 30, Penna

MORE DATA? Circle 71, inside back cover



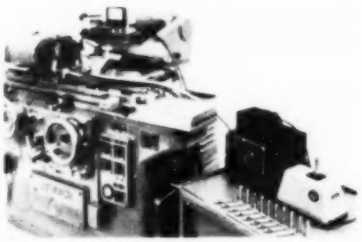
30-in.-dia Universal Chuck Features Controlled Pressure

New design enables user to control chucking pressure exerted on the workpiece. Amount of pressure exerted is dependent upon the drawbar pull, not upon the size of the work. These custom-built units will handle gears, rounds, and odd-shaped pieces. False jaws may be made by the user to handle additional parts as necessary. Rapid-acting jaws, which open wide for easy chucking of the part, pull the work back into the chuck and against positive rest stops. Since pressure can be controlled, parts may be chucked with a feather-light touch without distortion. Same unit can also be used to round up parts which have become distorted in heat treating simply by increasing the chucking pressure.

Complete factory calibration of the units greatly reduces setup and changeover time when used in conjunction with tooling charts supplied with each chuck. Available in a complete range of sizes, units may be used on almost any machine having a hole through the work spindle.

Garrison Machine Works, Inc, 515-525 Bannock St, Dayton 4, Ohio

MORE DATA? Circle 72, inside back cover



Universal Grinder Incorporates Match Grinding Attachment

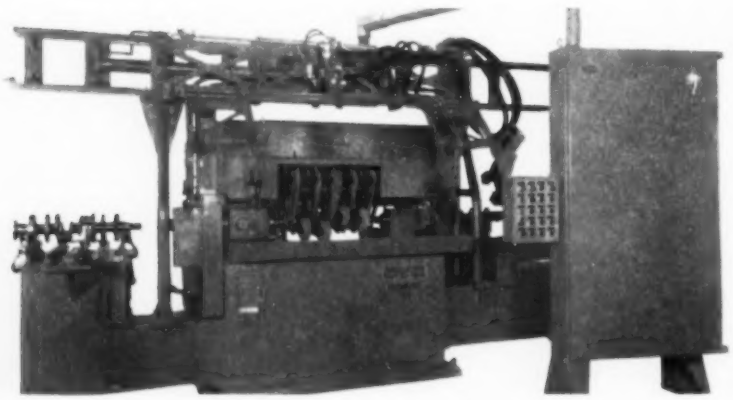
Swiss-made Studer RHU-450 is a hydraulically controlled production machine designed for match grinding, internal and external grinding, superfine and lap grinding.

Electronic measuring controls include a Movolimit electronic size control instrument for accurate grinding to a predetermined diameter from a master part, or the first workpiece in the run, and a Deltalimit match grinding instrument for match grinding a shaft to fit a specific bore diameter.

Unit will grind work up to 18 in. between centers with 8-in. swing. Workspindle speed is infinitely variable from 30 to 650 rpm. Accessories include an attachment for grinding cylindrical cams, a grinding wheel crush-forming device, and a special taper grinding attachment for extremely accurate grinding of tapers up to 45° in either direction.

Imported by Cosa Corp, 405 Lexington Ave, New York 17, NY

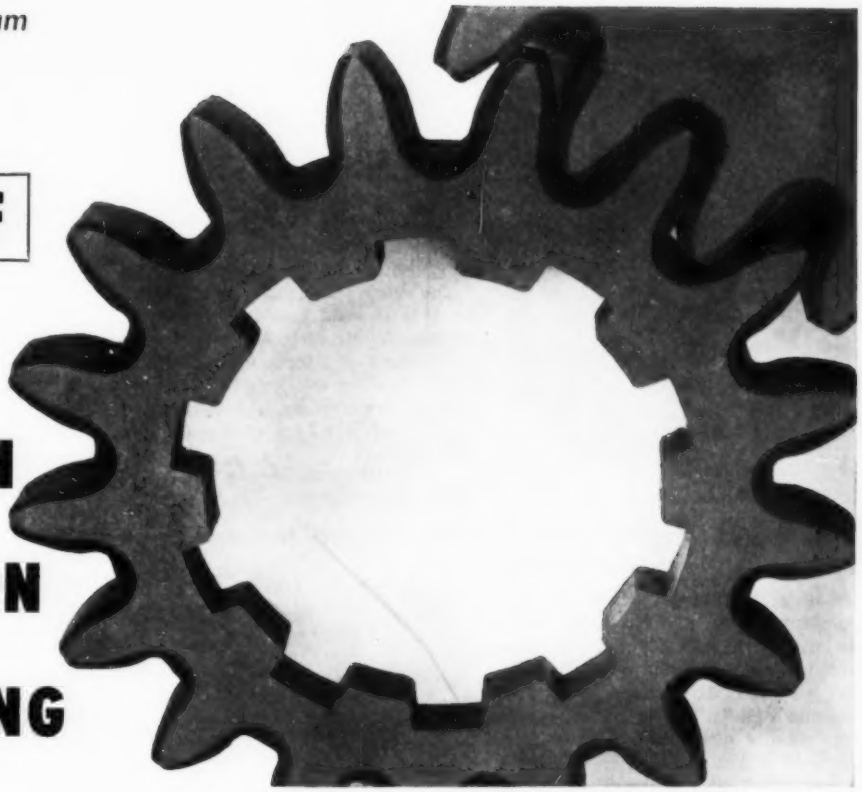
MORE DATA? Circle 73, inside back cover



CRANKSHAFT LAPPING MACHINE, the automatic model SFB, laps or roll burnishes bearing surfaces on crankshafts and fillet roll stress concentration points at diameter changes. Operation is similar to that for the manually operated machine (AM–Feb 23, p148) but this machine is equipped with hydraulically operated automatic loader and unloader. Machine has a 15-in. swing, accepts work up to 36 in. long, and can be provided with up to 16 heads—*Foote-Burt Co, Schraner Div, Cleveland 8, Ohio* MORE DATA? Circle 74, inside back cover

at Farrel-Birmingham

NEW S&F TOOTH-TO-TOOTH INDUCTION HARDENING



Typical hardening pattern along flanks and through root.

...produces toughest gears yet!

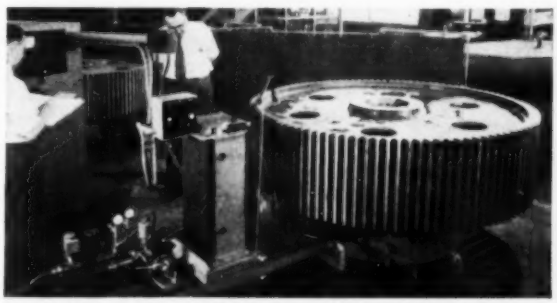
There's nothing like the S & F method of tooth-to-tooth gear hardening. Not only does it add amazing durability to big gears, but load-carrying capacity is vastly increased. Warpage can be insignificant depending on gear design. And there can be substantial savings in material and machining costs!

Farrel-Birmingham tells us that in one installation large gears with S & F induction-hardened teeth have already gone through over two years of rugged service with absolutely no sign of wear—whereas formerly, gears had to be *replaced* every two years. Reports of other installations are also highly satisfactory.

Precision controls maintain constantly accurate time, current, feed and distance between coil and workpiece to assure consistent results. In a group of similar gears, all portions of all teeth will have the same predetermined case contour and depth of hardness. In fact, hardening depth is so accurately controlled and warpage so minute that, for a number of gears, no additional machining is required.

S & F induction hardening units capable of handling gears from 3 in. to 20 ft. in diameter and larger, are available in semi-automatic and automatic models.

Want to know how this revolutionary approach to gear hardening can fit your production? Just ask us about it.



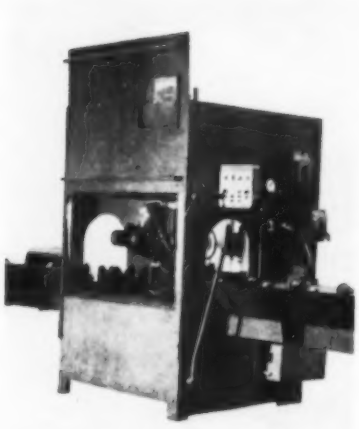
Spur, helical and double helical gears up to 157 in. diameter and 20 in. face widths are induction hardened tooth-by-tooth in this S & F equipment at Farrel-Birmingham, Ansonia, Conn.

KO CO. INC PRECISION MACHINERY

KURT ORBAN

COMPANY, INC.

36 Exchange Place, Jersey City 2, New Jersey



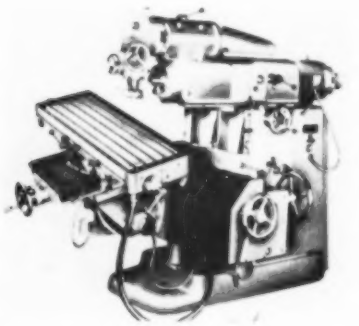
Pipe Machine Cuts and Bevels Variety of Materials at High Rates

Using a high-speed abrasive saw combined with moderate speed rotation of the pipe, the Media pipe cutting and beveling machine will cut all materials from the hardest ferrous metals to the softest nonferrous and non-metallic pipe, from ½ to 16 in.

According to the manufacturer, pipe joint preparation costs are reduced from 20 to 80%, depending on the category of pipe material and size. For example, the machine will cut 6 in. schedule 40 stainless steel pipe in 54 seconds and bevel it in an additional 6 seconds, compared with 20 minutes required using previous methods.

James Mitchell & Co, 117 Cooper St, Beverly, NJ

MORE DATA? Circle 75, inside back cover



Swiss Universal Milling Machine Designed for Model Shop Use

This SHW Omniplex Model UF-2 milling machine is said to have versatility in work table plane adjustments, sensitive range of cutter speeds, and fast tooling set up. It is designed for model shop work on die cavities or machine components.

Features include: 36 spindle speeds ranging from 33 to 2170 rpm; 9 feeds spaced from 15/32 in. to 10 in. per minute with a fine boring feed adjustable to 0.0002 in. per revolution; rapid transverse for the horizontal milling head and for the vertical and longitudinal table motions.

The work table measures 42½ in. by 15¾ in. and can carry a workpiece weighing up to 2200 lbs close to the column or a piece up to 1400 lbs in the extreme overhanging position.

It is powered by a 5½-hp main motor and a 1.7-hp motor for the feed motion.

Dist by Carl Hirschmann Co, Inc, 30 Park Ave, Manhasset, LI, NY

MORE DATA? Circle 76, inside back cover

Riveting Machine Feeds and Sets Semi-tubular Rivets up to 5/16 in.

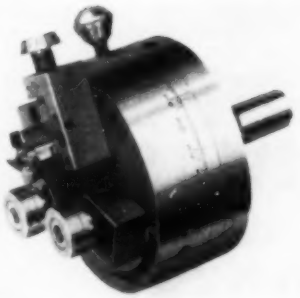
Model 110A riveting machine automatically feeds and sets semi-tubular rivets up to 5/16-in. dia and 1⅛-in. long. It has a standard throat depth of 10 in.

One of the features of this machine is an eccentric actuated toggle linkage attached directly to the spindle. It is said this mechanism enables the machine to develop a maximum force through the rivet setting range and eliminates most of the vibration and jar.

The Model 110A can be converted to the following modifications: throat depth of 12, 14 or 16 in., fixed center double drive up to 3 in. center distance, right or left hand feed, hydraulic power.

Tubular Rivet and Stud Co, Quincy, Mass

MORE DATA? Circle 77, inside back cover



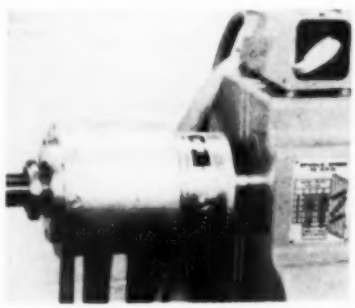
Calibrated Turning Head Uses a Four-Lip Cutter

Master Turner, designed for quick setup and direct reading ¼ to 1-in-scale for depth of cut, is recommended for fast, short-run production on screw machines and similar equipment. Four-lip cutter quadruples usual cutting life. If one cutting point burns out or chips, the device can be easily indexed to the next cutting position by loosening a screw.

Turner is constructed so as to permit supporting rollers to be adjusted either ahead or behind the cutter. Graduated dial screw is provided to adjust the cutter to proper diameter when rollers are ahead. Both supporting rollers and cutter are equally adjusted to desired diameters by a ring cam. Unit is made in various sizes; shanks may be obtained to suit any machine tool to which it is being adapted.

Patt Brothers Co, 37645 Vine St, Willoughby, Ohio

MORE DATA? Circle 78, inside back cover



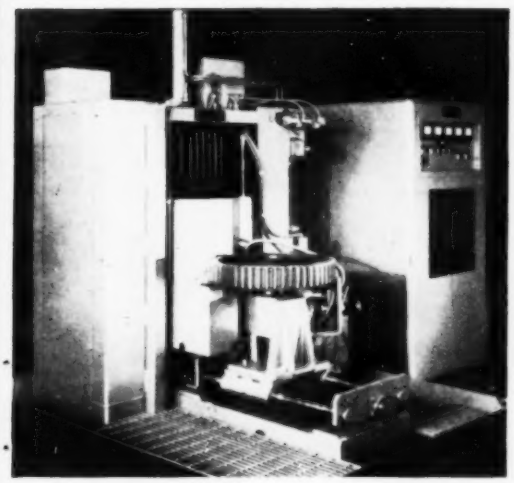
Chuck Actuator Operates Air Chucks and Collets

The actuator is a non-rotating air or hydraulic cylinder designed to operate machine tool chucks and collets. It is mounted on the rear end of the spindle and is connected to the drawtube through ball thrust bearings.

The manufacturer reports that the actuator eliminates the need for a

PATTERNS FOR IMPROVED GEAR PERFORMANCE

Magnethermic Induction Scanner Heat Treats 6" to 60" Diameter Gears at... SURPRISINGLY LOW COST



"Tooth—by—Tooth Gets to the Root"

This Magnethermic Induction Gear Machine scans each tooth.

All kinds of savings with this Magnethermic method . . . low power and limited initial investment. Improved physical properties, particularly in the critical root zone, in many cases allow use of smaller gears or change-over from expensive alloy steels to plain carbon grades.

Distortion minimized with only a small part of the gear heat affected; no over-all compressive forces.

Flexibility of scanning makes inductors applicable to varying face widths, machine adaptable to many gear types, plus sprockets.

With automatic indexing, attention is confined to loading and unloading . . . cumulative positioning errors are eliminated.

These advantages have been proved in actual installations.

For estimate, quotation or engineering evaluation, send prints or outline your requirements in a letter.

MAGNETHERMIC®
CORPORATION
3990 SIMON RD. • YOUNGSTOWN 7, OHIO

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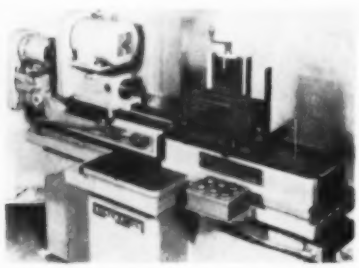
rotating union, provides power for holding either bar or chucking work, eliminates air leaks and vibration, and reduces downtime for repairs.

Standard sizes of the actuators range from 4¾ to 12 in. piston diameter and other sizes can be secured for special requirements.

PowerGrip, Inc, Rockfall, Conn

MORE DATA? Circle 79, inside back cover



Gun Drilling Machine Eliminates Secondary Finishing Operations

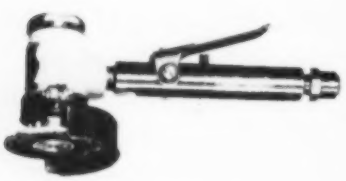
Boremation gun drilling machine is said to eliminate secondary drilling boring, reaming, and honing operations by using an exceptionally rigid feed unit which provides high accuracy and finish.

Feed range is infinitely adjustable and extends from ½ to 30 ipm. Spindle speeds range from 100 to 10,000 rpm.

Machines are available in 12-in. stroke and 24-in. stroke models.

Drillmation Co, 6500 E Eleven Mile Rd, Center Line, Mich

MORE DATA? Circle 80, inside back cover



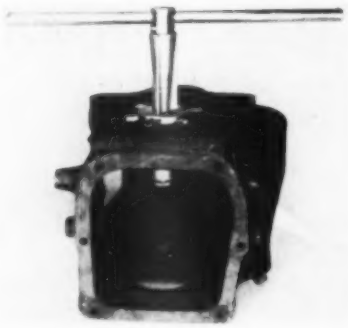
Gearless High Speed Air Grinder Develops 18,000 rpm Cutting Speed

This small, gearless high speed grinder develops speeds of 18,000 rpm and, according to the manufacturer, maintains it well under load and operates with a minimum of vibration.

The air tool, designated 12V-180 Angle Grinder, weighs 3¾ lb and has a 3-in. capacity depressed-center cutoff wheel. It may also be used as a sander.

Cleco Air Tools, Houston, Texas

MORE DATA? Circle 81, inside back cover



Knurling Tool Rehabilitates Castings by Raising Bore Metal

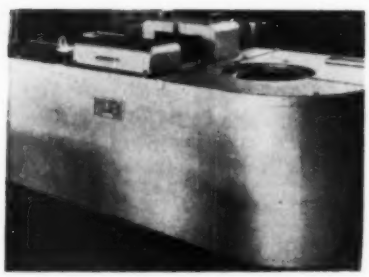
Worn castings can be rehabilitated with a new knurling tool which raises the metal in the bore making possible longer lasting fitting of bearings and parts.

The manufacturer reports that worn housing bores which have been raised with the knurling tool have attained up to 93% gripping power (knurled bore surface on the bearing) and have increased durability because the air spaces resulting from the knurling aid in heat dissipation.

The tool provides guides to fit bores up to 12 in. and adapters are available for larger bores. It can be used in such cylinders as transmission housings, generator end plates, differential housings, air compressor housings, transfer cases, power dividers, wheel hubs, speed reducers, fluid couplings, and torque converters.

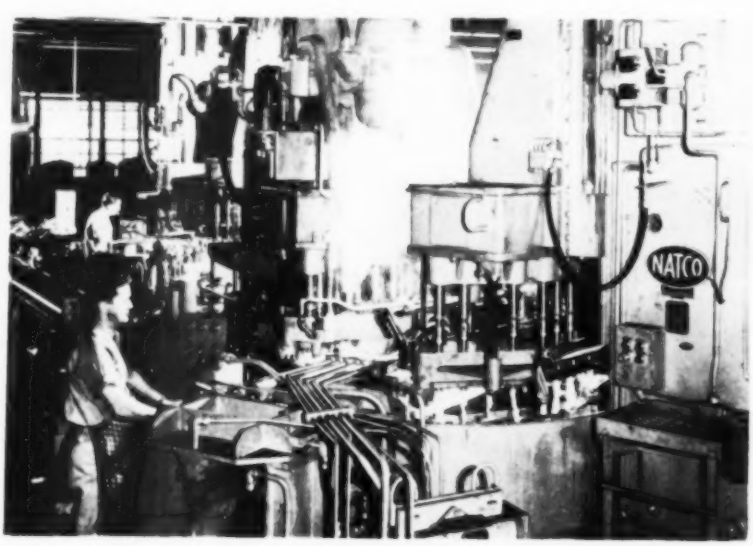
Peerless Tool Co, 4621 N LeClaire Ave, Chicago

MORE DATA? Circle 82, inside back cover



Three-Pot Salt-Bath Furnace Designed for Toolroom Use

Type 230 salt-bath furnace is designed for toolroom use in producing limited quantities of high-speed tool steel. It consists of three pot units: (1) a preheat gas-fired alloy pot for hardening and preheating any type high-speed steel at temperatures from 1300 to 1800 F; (2) a high heat two-electrode ceramic pot with temperature ranges from 1750 to 2350 F



CONNECTING RODS are machined at Chrysler's Trenton engine plant on this 9-station Natco dial index machine. Machining process eliminates a preliminary weighing and segregating operation. Four rods are loaded at station 1; they are located from the rough half round. Wrist pin hole is drilled, core drilled, chamfered, then semi-finished reamed. Parts are then unloaded. Production is 600 parts per hr—*National Automatic Tool Co, Inc, Richmond, Ind*

MORE DATA? Circle 83, inside back cover

CIRCLE 289 READER SERVICE CARD▶

At Teale Machine Co.,
a battery of 24 Automatic Screw Machines are busy around-the-clock machining all types of small parts from Youngstown Yolead Cold Finished Bars.

Accent on Excellence

Youngstown Yolead cold finished bars

Automation Machining—the combining of up to 20 difficult metal removal operations on the same part, synchronized mechanically or electronically into *one* machining cycle is the exclusive development of Rochester's Teale Machine Company.

Daily, they produce over a million small parts (¾-inch diameter and smaller) like these on a battery of 24 Automatic Screw Machines from the basic raw material—Youngstown Yolead Cold Finished Steel Bars.

They have found this versatile leaded steel provides outstanding machinability, fewer rejects, longer tool life, superior surface finishes, and enables the use of optimum cutting speeds. This has spelled cost reductions for Teale customers everywhere.

Wherever leaded steel becomes a part of things *you* make, the high standards of Youngstown *quality*, the personal touch in Youngstown *service* will help you create products with an "accent on excellence".

THE
YOUNGSTOWN
SHEET AND TUBE COMPANY *Youngstown, Ohio*

Manufacturers of Carbon, Alloy and Yoloy Steel

for treating high carbon, high chrome, and air hardening steels; (3) a gas-fired pressed steel pot for quenching at heat levels from 1000 to 1450 F. All are neutral salt baths.

The manufacturer claims the furnace provides: low cost investment, no scale at any temperature, uniform heating and hardening with thin or heavy work pieces, and minimum distortion. It also reports that many types of tools such as hobs and taps can be hardened to size with no finishing required.

The A F Holden Co, 14341 Schaefer Hwy, Detroit 27, Mich

MORE DATA? Circle 84, inside back cover

Open-Side Wheel Dresser Runs On Resilient Bushing

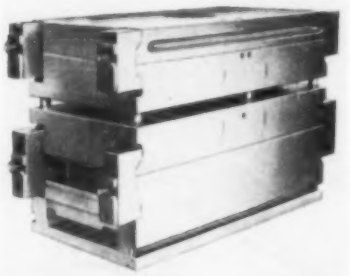
Designed to shape and sharpen wheels and disks from ¼ through 20 in. in diameter, this open-side wheel dresser has five independently rotating wheels that run smooth and true on a resilient bushing. Worn cutters can be replaced instantly. The dresser is priced at $2.95, the extra cutters at 45¢ each.

Thompson Sales Co, 116 West 12th St, Erie, Penna

MORE DATA? Circle 85, inside back cover

HOLD-DOWN CLAMPS, called Insta-Clamps, are reported to hold down jigs and fixtures to the full capacity of the clamp without using shims. They won't tip over when clamping to narrow grooves, ledges, or corners. Four-inch long clamps sell for $7.50 a pair, eight-inch clamps for $12.75—*Insta-Clamp Co, 2420 Home Place, Dearborn 8, Mich*

MORE DATA? Circle 86, inside back cover



Standard Assemblies Available For Zinc, Aluminum Diecasting

Standard-unit die assemblies, which enable the diecaster to replace cavities at minimum cost in a matter of minutes, are now available for zinc and aluminum diecasting.

Three sides of the die are open for easy installation of cores or coolant lines. Twin replacement units are standard 9⅞ in. by 11⅞ in. to assure availability of cavity plates from stock. All parts are DME standard.

Detroit Mold Engineering Co, 6686 E McNichols Rd, Detroit 12, Mich

MORE DATA? Circle 87, inside back cover

Compact Machine Automatically Grinds Miniature Bearing Races

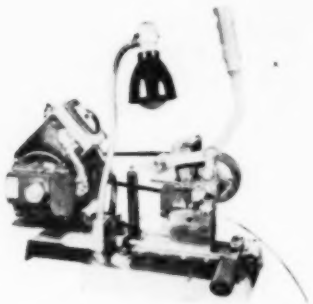
Built specifically for grinding bores in miniature bearing races and internal ball tracks in miniature bearing outer races, the Bryant Miniature Centalign Model B internal grinder requires only 8¼ sq ft of floor space.

Workpieces are automatically loaded, ground, and unloaded by means of a new disc drive shoe centerless fixture which provides interchangeable packaged tooling that can be set up away from the machine.

This fixture can be used to grind a complete range of bores and raceways in miniature bearing races up to 0.625 OD. Other features include separate variable cross feed speeds for both rough and finish grind operation, and selective skip dressing.

Bryant Chucking Grinder Co, Springfield, Vt

MORE DATA? Circle 88, inside back cover



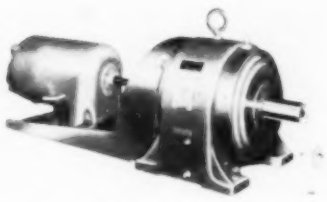
Deburring Machine Handles Variety of Finishing Operations

An adaptation of the company's Hand Miller, this high speed deburring machine is capable of handling a wide range of finishing operations. It can rapidly grind down excess welding flash and it can reach into such inaccessible spots as casting slots. Production increases of up to 65% are reported.

Conversion of the Hand Miller to a deburring machine is quite simple. The speed is stepped up to 10,000 rpm, a high-speed carbide burr is attached to the output shaft, and a fixture is adapted to hold the workpiece.

H B Rouse & Co, 2214 N Wayne Ave, Chicago 14, Ill

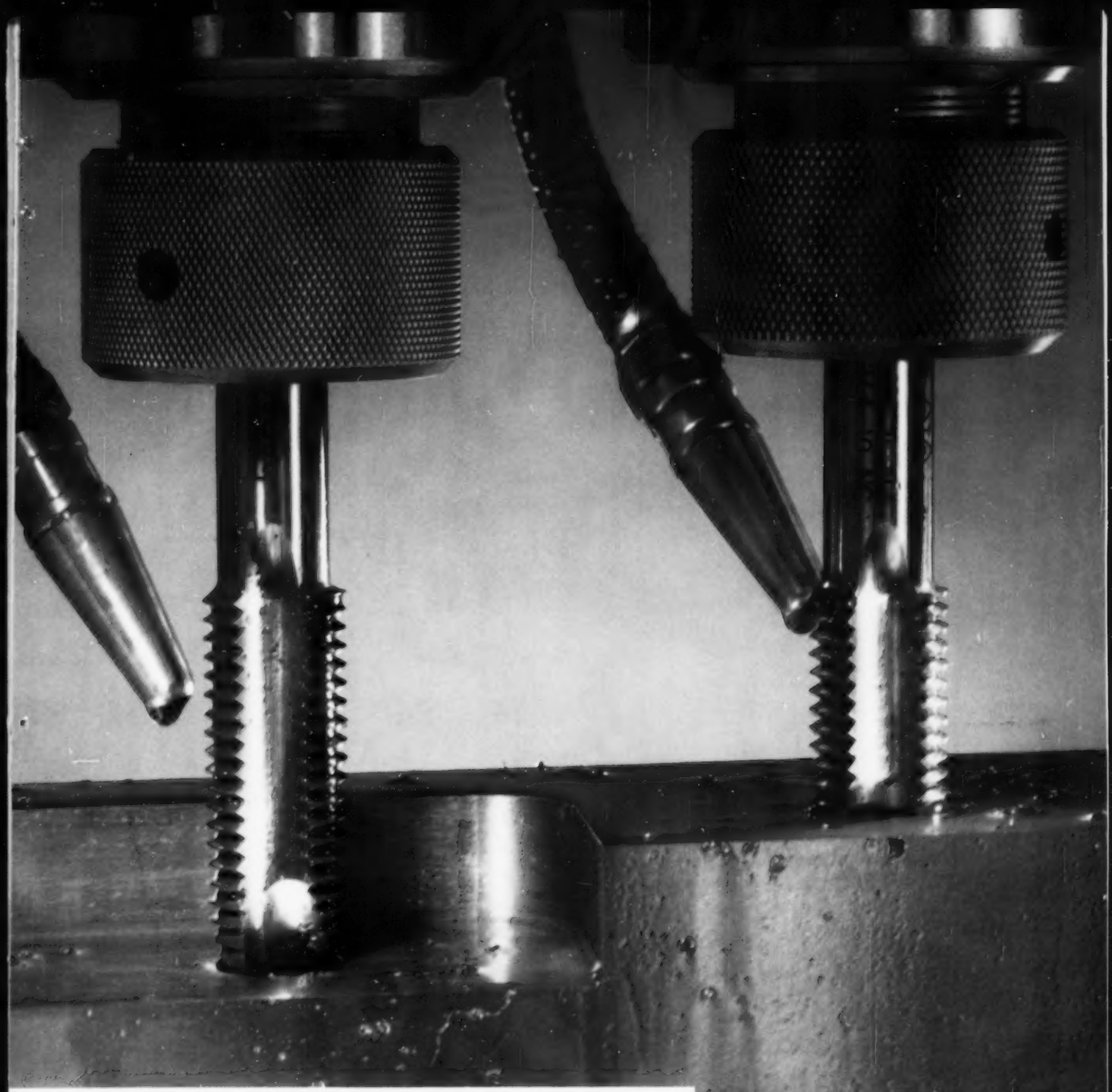
MORE DATA? Circle 89, inside back cover



New Gear Reducer Combination Has 4 or 8 Output Shaft Speeds

Combined gear reducer and gear-shift drive unit is designed specifically for applications where more than one speed on the output shaft of the gear reducer is required. New

(Continued on page 182)



HAVE "GUN" TAP... WILL TRAVEL

Let your "Greenfield" Man tell you about the original spiral pointed tap... the "Gun" tap, developed by Greenfield to lick tap enemy No. 1, breakage due to chips clogging in the flutes. This problem is especially troublesome in "stringy" metals where chip is long and curling.

The "Gun" point solves the problem in through holes by causing the chips to shear and "shoot" out ahead of the tap.

In some cases even blind holes can be tapped if there is sufficient space at bottom of hole for chip accumulation.

Yes, if you've got tapping troubles, send for the "Greenfield" Man, he'll *travel*.. and fast!

GREENFIELD TAP & DIE
GREENFIELD, MASSACHUSETTS

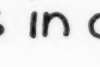
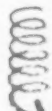
Better use that modern phone to call in a GEOMETRIC man and learn how New Geometrics may update your threading operations and increase your profit margin.

Geometric has no yearly model, improvements are incorporated as developed – so the newest Geometric is always the best.

CALL YOUR GEOMETRIC DISTRIBUTOR TODAY

GEOMETRIC – HORTON

NEW HAVEN 15, CONNECTICUT

If it rolls on an axle or turns in a bearing or rides on a shaft if it slides in a groove  or moves on a pivot if it bores  or cuts or transmits pressure

one of Sinclair's 500 specialized lubricants is designed to make it work better.

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SINCLAIR REFINING COMPANY

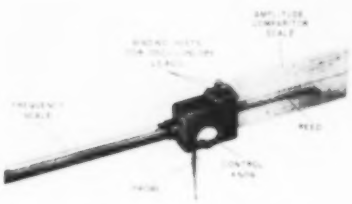
Technical Service Division
600 Fifth Ave, N.Y. 20 N.Y.

line includes double and triple gear reduction units. Motor capacities are rated from 1 to 10 hp.

By moving the shift lever on the gearshift drive into one of four positions, four different output shaft rpms are obtainable on the reducer. Eight different speeds are obtained on the reducer output shaft through use of a two-speed motor in the gearshift drive. Standard electrical characteristics of the combination are: constant-torque, 3 or 2 phase, 60 c, 208, 220/440, or 550 v.

Lima Electric Motor Co, Dept 132, Lima, Ohio

MORE DATA? Circle 90, inside back cover



Compact Instrument Indicates Vibration Frequency, Amplitude

Reed Vibrometer is a light, compact instrument that can be used to (1) measure vibration frequency and amplitude, (2) determine direction of transmitted disturbances, (3) locate cause of noise due to resonant vibration, (4) measure speeds of rotating equipment where shafts are not readily accessible.

It has a frequency range from 120 to 15,000 cpm and is accurate to within 10% at all frequencies with the reed weighted, and 3% with the reed free.

The instrument weighs 1 lb and measures 9¼-in. long by 1⅝-in. high by 1-in. wide. Cost is $55.

Korfund Co, Inc, 48-39B, 32nd Place, LIC 1, NY

MORE DATA? Circle 91, inside back cover

English Surface Finish Tester Is Portable, Semi-Automatic Unit

Talysurf Model 100 is a portable, semi-automatic instrument suited to a wide range of production application in precision testing surface finish, according to the manufacturer.

Work table, pick-up, stylus, and support are combined with motorized drive in one solid assembly which can carry small work in universal workholding fixtures or be fitted with special quick-loading production tooling. The same unit can be inverted to check large flat or cylindrical work.

The fast testing cycle gives unwavering average readings in one stylus traverse on the separate meter unit.

Distributed by Engis Equipment Co, 431 S Dearborn St, Chicago 5, Ill

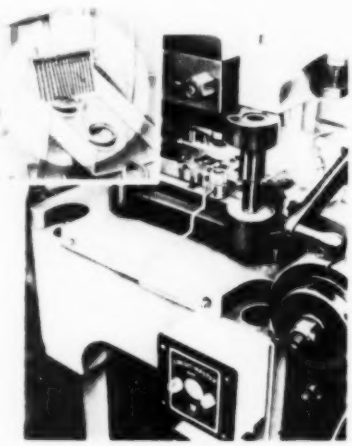
MORE DATA? Circle 92, inside back cover

Brown & Sharpe Introduces New High-Speed Thriftmill

Unit can be economically used for profiling, slotting, peripheral milling, and many other end milling operations. Ground-from-the-solid, volume production results in shank tolerance of 0.000 to –0.0005 and cutter diameter of 0.000 to –0.005. It has a 10° rake, 30° helix, and is RH cutting; available in six sizes from ⅛ to ½ in.

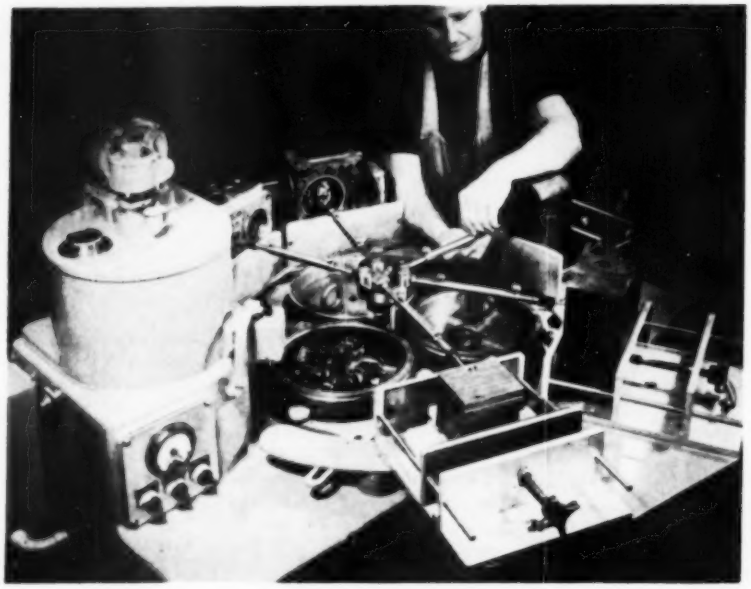
Brown & Sharpe Mfg Co, Cutting Tool Div, Providence 1, RI

MORE DATA? Circle 93, inside back cover



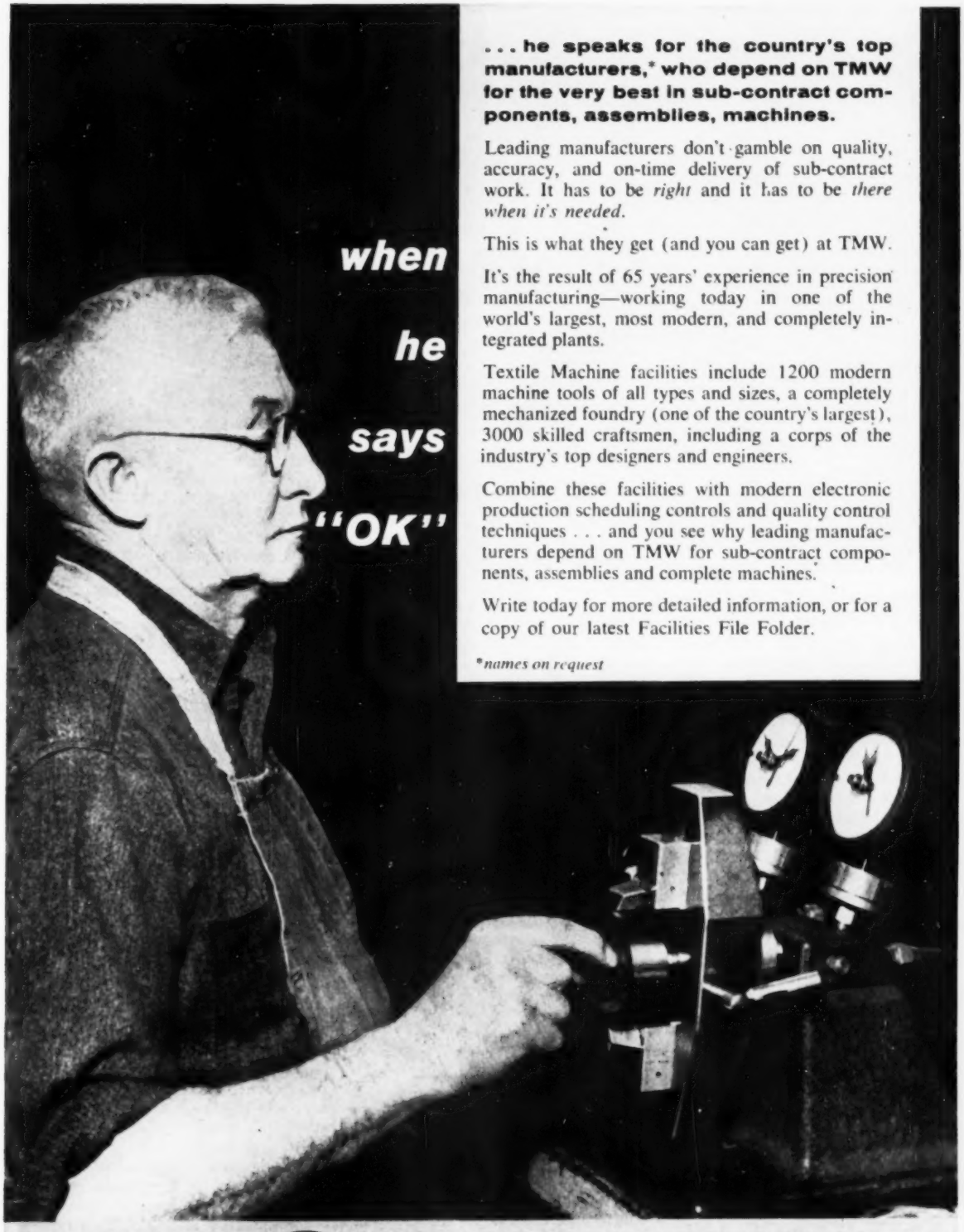
Missing Parts Detector Prevents Machine Damage

Electronic control unit, called the Circuit Master Missing Parts Detector, automatically disengages the clutch of a power machine when



AIR BRAKE PARTS are lapped on this Model 24 Lapmaster which is equipped with 5-station fixture that permits lapping of valve faces on the lapping table while reciprocating blocks internally lap valve seats. When small lapping blocks go out of flat, they are reconditioned on the lapping table—*Crane Packing Co, Morton Grove, Ill*

MORE DATA? Circle 94, inside back cover



. . . he speaks for the country's top manufacturers,* who depend on TMW for the very best in sub-contract components, assemblies, machines.

Leading manufacturers don't gamble on quality, accuracy, and on-time delivery of sub-contract work. It has to be *right* and it has to be *there when it's needed.*

This is what they get (and you can get) at TMW.

It's the result of 65 years' experience in precision manufacturing—working today in one of the world's largest, most modern, and completely integrated plants.

Textile Machine facilities include 1200 modern machine tools of all types and sizes, a completely mechanized foundry (one of the country's largest), 3000 skilled craftsmen, including a corps of the industry's top designers and engineers.

Combine these facilities with modern electronic production scheduling controls and quality control techniques . . . and you see why leading manufacturers depend on TMW for sub-contract components, assemblies and complete machines.

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**names on request*

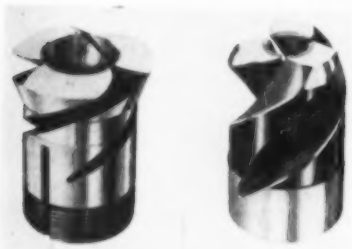
TEXTILE MACHINE WORKS
Contract Division • Reading, Pennsylvania

parts fail to eject. Auxiliary protection is provided against misfeed, buckling, and overload.

Device, under the control of Circuit Master Mark III, consists of a sensitive spring wire assembly that detects non-ejections, and shuts off power before damage can occur. It is completely automatic, requires neither setting, supervision, nor adjustment.

Wintriss, Inc, 20 Vandam St, New York 13, NY

MORE DATA? Circle 95, inside back cover

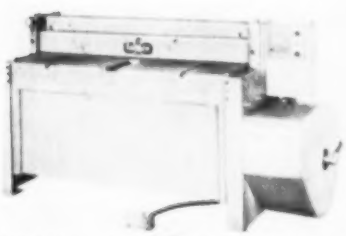


Guide Bushings Reduce Seizing Of Barstock in Swiss Automatics

Featuring helical rather than straight slots, these carbide guide bushings are available for any Swiss automatic screw machine. The helical slot design permits lubricant to reach the barstock at a much faster rate, eliminating seizing of the bar, reducing play of the bar, and reducing the need for the more expensive rotating guide bushings. Bushings are available in both drawn and push types, in fractional sizes. Special sizes are also available. Cost is reported to be equal to or lower than that of conventional bushings.

Distributed by Continental Precision Corp, 487 Broadway, New York 13, NY

MORE DATA? Circle 96, inside back cover



High-Speed Power Shears Equipped With Pneumatic Clutch and Brake

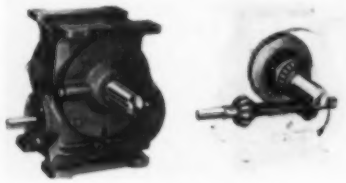
Four new high-speed power shears equipped with pneumatic clutch and brake have been added to the Famco Machine Co line. The shear operates at 300 strokes per minute.

Shear features include: heavy-duty steel side members, all-steel reinforced knife frame, all-steel bed of box type construction, fully gibbed hold-down, four-edged alloy tool steel shear knives.

The machine can cut 16 gauge mild steel, 18 gauge stainless or heavier gauges of aluminum in widths of 36, 42, 52, and 72 in.

Famco Machine Co, 3100 Sheridan Rd, Kenosha, Wis

MORE DATA? Circle 97, inside back cover



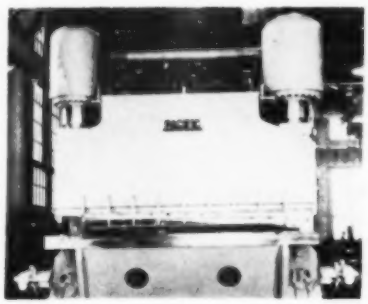
Worm Gear Speed Reducer Mountable in 3 Positions

Universal unit can be mounted in three different positions: worm shaft below gear, worm shaft above gear, and output shaft vertical. Models are available in 2½, 3, 3½, and 4-in. centers with up to 13½-hp input rating and 7240 lb-in. output torque rating.

Cost of horsepower has been reduced by using a one-piece cast iron housing with external fins for cooling, and an aluminum radial fan which directs air over the fins.

Link-Belt Co, Prudential Plaza, Chicago 1, Ill

MORE DATA? Circle 98, inside back cover



HYDRAULIC SHEAR with a 12-in. opening is used in heavy rolling mill line at the Oak Ridge Nuclear Plant. Powered knife clearance permits quick adjustment of shear to cut alloys up to 1¼-in. thick by 8-ft long. Hydraulic power eliminates shock and prevents overloading for safe cutting of exotic materials—*Pacific Industrial Mfg Co, 838 49th Ave, Oakland, Calif*

MORE DATA? Circle 99, inside back cover

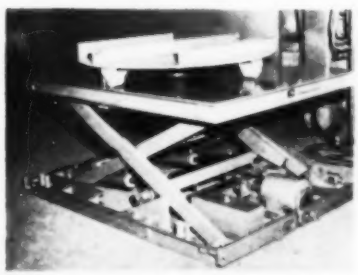
Portable Tumble-Finisher Has Variable Speed Drive

Model RA Rollabrader for small parts finishing has lift-off removable barrel, and drive adjustable from 20 to 46 rpm. The 0.5 cu-ft machine incorporates a barrel drive system using four neoprene rollers and dual drive shafts. Heavy-duty welded construction makes it suitable for steel ball burnishing.

Model is 25¼ in. high, 31 in. long, and 17½ in. wide; barrel is 8¾ in. wide with roller flanges 17⅜ in. dia; shipping weight is 102 lbs, price is $168.50.

Rampe Mfg Co, 1⅓915 Woodworth Ave, Cleveland 10, Ohio

MORE DATA? Circle 100, inside back cover



Hydraulic Lift Table Equipped With Turntable Loading Top

This model hydraulic lift table is designed to make it easier for an operator to load heavy, cumbersome products on a rack. Using a foot-pedal switch, the operator can adjust the height of the table (which supports the rack) so that there is always an empty space on the rack at a convenient working height. When one side of the rack is filled, it is spun around by the turntable.

Weld-Bilt tables can be furnished in capacities up to 30,000 lbs, or more in special applications. Dimensions of the table illustrated are 54 in. wide, 79 in. long. It has a lifting range of 42 in.

West Bend Equipment Corp, West Bend, Wis

MORE DATA? Circle 101, inside back cover

PRODUCING with LE MAIRE

THIS

The LeMaire SU-5 way-type units are extremely suitable as "building blocks" which can be used over and over in widely varied applications. They are entirely self-contained, with cross-keyed construction which permits ready removal and re-mounting. Features of the units include variable delivery pump, hardened and ground ways, automatic lubrication and spindle speed changes. For ease of maintenance and replacement, all component elements are manifolded to provide ready accessibility.

VERSATILE NEW LEMAIRE UNIT POWERS EVERY OPERATION ON THIS LEMAIRE MACHINE

Here's real "Building Block" construction for simple, economical automation! For here, on just one rotary indexing machine you'll find six *identical* LeMaire way-type hydraulic units performing nine *different* machining operations . . . with an arrangement which permits easy, rapid change over to process three different sized parts as required.

The part is a diesel engine rocker shaft bracket. Setups for three different size parts are readily made with adjustable adaptors on the fixtures and adjustable spacers on the milling arbors. Production is 112 pieces per hour at 100% efficiency. Here's what happens at each station.

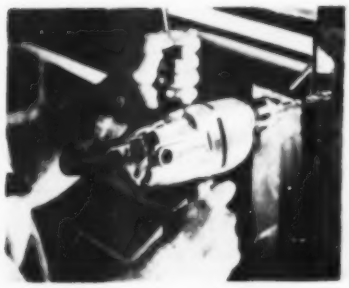
(1) Load **(2)** Drill large hole **(3)** Spot face and chamfer large hole **(4)** Ream large hole **(5)** Straddle mill top of boss and mounting face **(6)** Drill small cross hole to half depth **(7)** Drill small cross hole to full depth **(8)** Finish mill mounting face **(9)** Finish bore large hole to .0005" tolerance.

The machine features precision balanced spindles for milling and boring, a variable speed pump to power the hydraulic indexing mechanism, automatic lubrication, and J.I.C. electrical and hydraulic systems. Perhaps a similar arrangement of versatile LeMaire way-type units can simplify your production machining problem. Call or write for consultation with a LeMaire field engineer.

LE MAIRE MACHINE TOOL COMPANY

2657 S. TELEGRAPH ROAD
DEARBORN, MICHIGAN

Designers and Builders of Special High-Production Machines



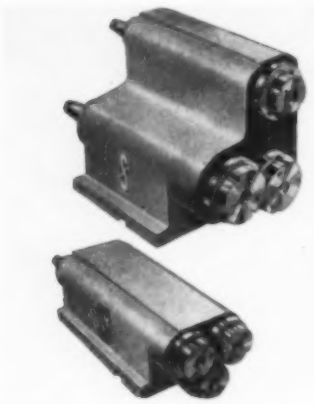
Black and Decker Adds Two Electric Drills to Line

Two portable electric drills added to the company's line are a ½-in. special drill with a 62% increase in power and a low cost ¼-in. drill. The ½-in. model illustrated above drills diameters up to ½ in. in steel, ¾ in. in masonry, 1 in. in hardwood, and drives hole saws up to 2 in. It weighs 7½ lbs and lists for $49.95.

The ¼-in. model weighs 3 lbs and has a drilling capacity of diameters up to ¼ in. in steel, ½ in. in hardwood, and will drive hole saws up to 1⅛ in. Cost is $16.95.

Black and Decker Mfg Co, Towson 4, Md

MORE DATA? Circle 102, inside back cover



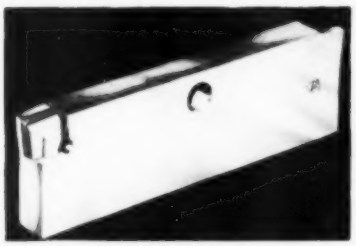
Machine Spindles Offered In Variety of Arrangements

Cluster design of boring spindles (above) illustrates two assemblies that can be furnished in a wide range of variations.

Each unit incorporates two or more of company's super precision boring spindles. Seven individual stock sizes are available to serve the average production requirement. Housing is designed to match the multiple holes to be machined. Where unusually close center distance of holes involves a special design, manufacturer can furnish it.

Standard Electrical Tool Co, 2488 River Rd, Cincinnati 4, Ohio

MORE DATA? Circle 104, inside back cover



Throwaway Insert Cutter Blocks Designed for Use in Boring Bars

Introduced for use in standard Davis block-type boring bars, two-cutter blocks for rough boring, and single-

(Continued on page 188)

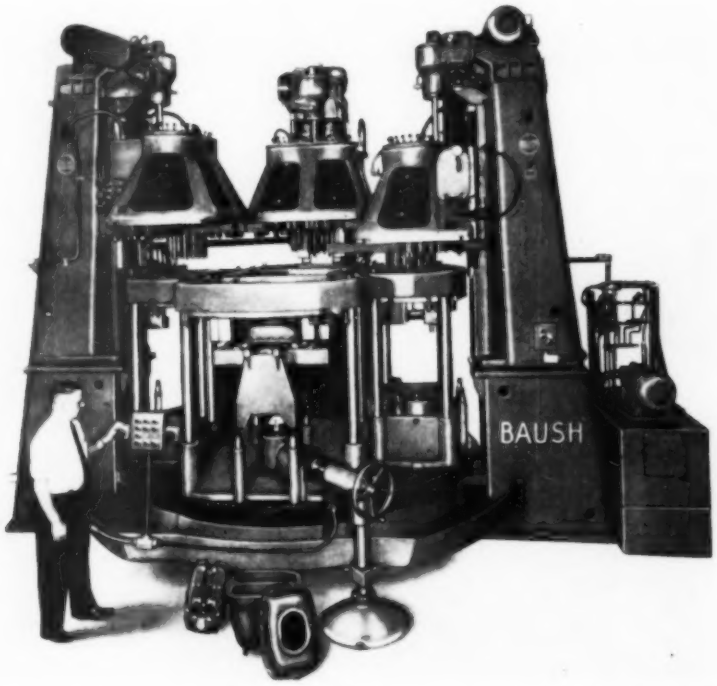
Adjustable Wrenches Feature Spanner and Offset Extensions

Spanner wrench set consists of two chrome-plated wrenches with adjustable spanner extensions and an additional set of offset extensions. The extensions permit easy removal and replacement of gland and packing nuts having either holes or slots.

One wrench is an 8-in. size for ¼-in. to 1⅛-in. ID. The other is a 12-in. wrench for ⅞-in. to 2¼-in. ID, with the additional pair of offset extensions increasing the range to 3½ in.

Hydraulic Jack Packing and Tool Co, Bloomfield, NJ

MORE DATA? Circle 103, inside back cover



GAS METER PARTS are drilled, tapped and reamed on this special machine built around three of the company's M-20 machines. These machines feature mechanical leadscrew feed for drilling, tapping and reaming. Spindle feed can be varied from 0.005 to 0.090 ipr; speeds from 130 to 1059 rpm. The machine illustrated has a total of 98 spindles and a 124-in.-dia rotary table with four indexing stations—*Baush Machine Tool Co, 156 Wason Ave, Springfield 7, Mass*

MORE DATA? Circle 105, inside back cover

the A B C's of SHORT RUN SHEET METAL PRODUCTION

A TEMPLATE MAKING
with the WIEDEMANN COORDINATOR

From producing precision templates . . . to fast accurate hole inspection . . . to high speed production of panels, chassis and other pierced parts, you can do the entire job in 60% to 90% less time with the Wiedemann Team—Coordinator, Inspector and Turret Punch Press.

Layout and setup are completely eliminated. Template holes are located on the Coordinator to X and Y dimensions using optical scanners, and drilled in rapid sequence. To assure optimum accuracy, template hole locations can be checked quickly on the Wiedemann Inspector. Then, working to the template, parts are pierced at amazing speed—30 to 100 holes a minute—with a Wiedemann Turret Punch Press. Complete flexibility of hole size, shape and location is assured. Even extensive engineering changes can be made on-the-spot at minimum cost.

Job shops and manufacturers alike are discovering the profitable difference the Wiedemann Team makes. Write today for full information.

B TEMPLATE INSPECTION
with the WIEDEMANN INSPECTOR

C HIGH SPEED PIERCING
with the WIEDEMANN RA-41P TURRET PUNCH PRESS

SAVE 60%-90% ON YOUR WORK

Send typical drawings of your work, and let us show you how the WIEDEMANN METHOD can cut your production costs 60% to 90%.

WIEDEMANN MACHINE COMPANY
TURRET PUNCH PRESSES

DEPT. AM-3 • GULPH ROAD • KING OF PRUSSIA, PA.

CIRCLE 295 READER SERVICE CARD

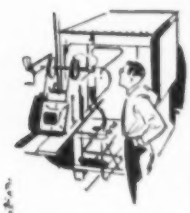
Herbert W. Westeren,
Asst. Director of Hayes Research & Development Group, Reports . . .

PRODUCTION HEAT TREATING BREAKS THE 3000°F. BARRIER

Today's "exotic" refractory metals for nuclear reactors, rocket engines, and electronic components call for heat treating temperatures of 3000°F. plus . . . temperatures heretofore limited to the laboratory.

Vacuum is often the answer. In keeping with our leadership in the vacuum field, our group developed a high temperature, high vacuum furnace for sintering, annealing, and firing operations. This versatile modification of the well-received Hayes VacuMaster® features changes in valving, power requirements, and low voltage heating elements to extend temperatures into the 4500°F plus range. Scaled for full production, Model HT/HV affords advantages of rapid cycling, saturable reactor control, cold wall construction, and vacuum to 0.1 micron.

Atmosphere furnaces are needed, too. For processing with non-oxidizing atmospheres, our group also developed the M-Y Moly Element Furnace. Uses of this 3300°F unit: reducing tungsten and silicon, ceramic metallizing, and other ultra-high temp. work. Also in design is an oxidizing and reducing atmosphere electric furnace for the 3500°F range.



These new Hayes furnaces, developed under actual production conditions in our lab, are now serving industry on high temp. jobs perhaps similar to your own. Vacuum Furnace Bulletin 5709A and M-Y Furnace Bulletin 5805 give details. Write for copies.

C. I. HAYES, INC.
837 Wellington Avenue • Cranston 10, R. I.
Established 1905

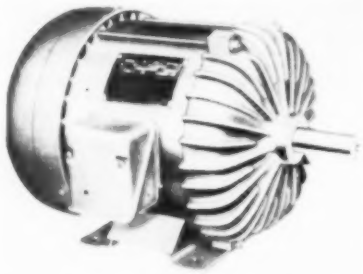
"It Pays To See Hayes" for metallurgical guidance, laboratory facilities, furnaces, atmosphere generators, gas and fluid dryers.

cutter micrometer-adjustable style for semi-finish or finish boring, are available with positive or negative rake in Series G8, G6, and G4, covering a bore range of 2½ through 17 in. Blocks are hardened to 40 to 45 R_c.

Two-cutter models with opposed cutter design, prevent out-of-round boring. Diameter tolerance can be held to 0.004 in. Single-cutter type has a micrometer-adjusting screw that positions the block in the bar slot permitting boring to tolerances of 0.001 in. Square carbide throwaway insert and carbide chip breaker are held in place by a screw clamp for easy indexing or replacement. Blocks slip into the bar without disassembling.

Giddings & Lewis Machine Tool Co, Davis Boring Tool Div, Fond du Lac, Wis

MORE DATA? Circle 106, inside back cover

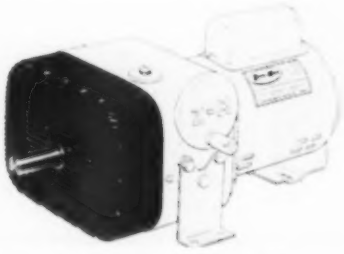


Single-Phase Motors Available In Totally Enclosed Models

A new line of single-phase motors, totally enclosed, fan cooled and explosion proof, is available in two, four and six pole speeds. The motors are built in re-rated NEMA frames 182, 184, 213 and 215 and they are rated from ¾ to 5 hp.

Robbins and Myers, Inc, Motor Div, Springfield, Ohio

MORE DATA? Circle 107, inside back cover



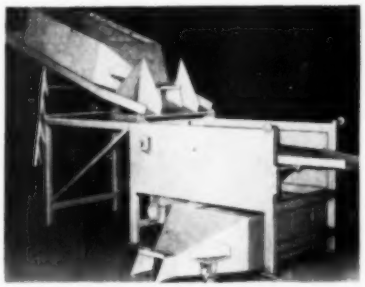
Two-Step Gearheads Multiply Speed, Torque of Speed Controls

Series of two-step gearheads multiplies the speed range of Zero-Max infinitely variable speed controls from 0 to 400 rpm to 0 to 2000 rpm or raises the torque limit from 100 in.-lb to 450 in.-lb.

The gearheads are available in eight ratios including 2, 3, 4, or 5 to 1 and 1 to 2, 3, 4, or 5. They are compactly housed in a short extension of the Zero-Max case so they become an integral part of the unit with common lubrication.

Revco, Inc, 1900 Lyndale Ave S, Minneapolis 5, Minn

MORE DATA? Circle 108, inside back cover



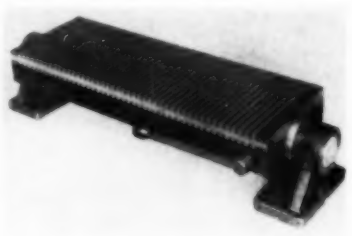
Heavy Duty Screen Separator Has Variable-Speed Drive

Model SS-3 screen separator is a flexible, heavy duty machine for fast separation of tumbling media and processed parts. It has a variable-speed drive and adjustable loading angle as well as a complete selection of interchangeable 24 by 48-in. screens. Movement of the screen can be adjusted from 0 to 2 in., with reciprocations variable from 185 to 450 per minute.

Model SS-3L offers straight through front-to-back operation, and Model SS-3S has front loading and front discharge for small space installations. Height to top of cradle is 66 in. above floor.

Rampe Mfg Co, 14915 Woodworth Ave, Cleveland 10, Ohio

MORE DATA? Circle 109, inside back cover



Swivel Base Magnetic Chucks Tilt 45°, Have Ceramic Magnets

New line of permanent magnetic chucks has swivel bases to increase chuck usefulness in flat or angular

introducing a

NEW

OLOFSSON

HEAVY DUTY PRECISION BORING MACHINE

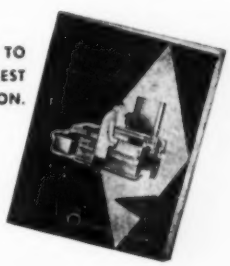
Designed for better precision finishing...semi-finishing...and roughing of large, bulky parts

This newest in the line of Olofsson Precision Boring Machines, the Model 22, is designed for more profitable heavy-duty rough and finishing boring, facing, chamfering, turning and grooving operations. Put one to work . . . and profit potential goes up. Because of the versatility of its new design, operating costs go down.

MODERN, WITH 22 QUALITY-DESIGN FEATURES, the Olofsson Model 22, weighs a hefty 7,600 lbs., untooled; and incorporates such design features as:

- *Extremely low ratio, height to width, of spindles to ways.*
- *Hardened and ground Alloy Steel flat and vee ways.*
- *Extra-large fixture mounting provides maximum stability for mounting large work pieces.*
- *Integral chip chutes completely surround any fixture tooling.*

WHATEVER YOUR PRODUCTION REQUIREMENTS. IT WILL PAY YOU TO FULLY INVESTIGATE THE MODEL 22. CONTACT YOUR NEAREST OLOFSSON REPRESENTATIVE. Or, if you prefer, write direct to OLOFSSON.



THE OLOFSSON

LYONS AVENUE, LANSING, MICH. *Phone:* IVanhoe 4-5381

MANUFACTURERS OF PRECISION BORING AND SPECIAL MACHINERY

CIRCLE 297 READER SERVICE CARD

machining operations. Chuck and workpiece may be tilted 45° right or left of center.

Ceramic magnets are used to provide excellent workholding ability, even on very thin parts, according to the company. Secondary external fields are controlled to prevent magnetism from invading the machine table and ways. In the off position the chuck is completely demagnetized.

Model illustrated has a 8 by 24-in. table face. A complete range of sizes is available.

O S Walker Co, Worcester, Mass

MORE DATA? Circle 110, inside back cover

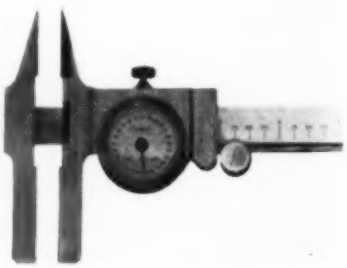
Plastic Envelope Protects Paper Industrial Tags

This clear plastic envelope protects ordinary paper tags against weather, wear and soiling. It can be used on transformers, switches, valves, machinery and similar items.

The plastic tag protector comes in three sizes with or without metal chain. Prices start at $13 per 100. Sample sent free upon request.

Bedford Products, Inc, PO Box 36, Roanoke, Va

MORE DATA? Circle 111, inside back cover



DIAL READING CALIPER permits measurement accuracy up to 0.001 in. Made of stainless steel and brass, the caliper is available in 6 and 8-in. models selling for $39.90 and $42.00, respectively—*Titan Tool Supply Co, 1419 Hertel Ave, Buffalo 16, NY*

MORE DATA? Circle 112, inside back cover

A NEW HIGH IN QUALITY CONTROL MEANS A NEW HIGH

in Quality Fasteners from

ALLEN

Long famous for advanced quality control techniques, Allen has expanded its Quality Control Division in its great new plant. From coil or bar stock right thru to the label on the box, each lot of Allenoy Steel is coded with its own number and checked with the finest equipment available. Furthermore, screws in process are gaged for dimensional accuracy—right at the machines.

If you want better performance made possible by the latest in manufacturing facilities, techniques and know-how, always insist on genuine *Allen* products.

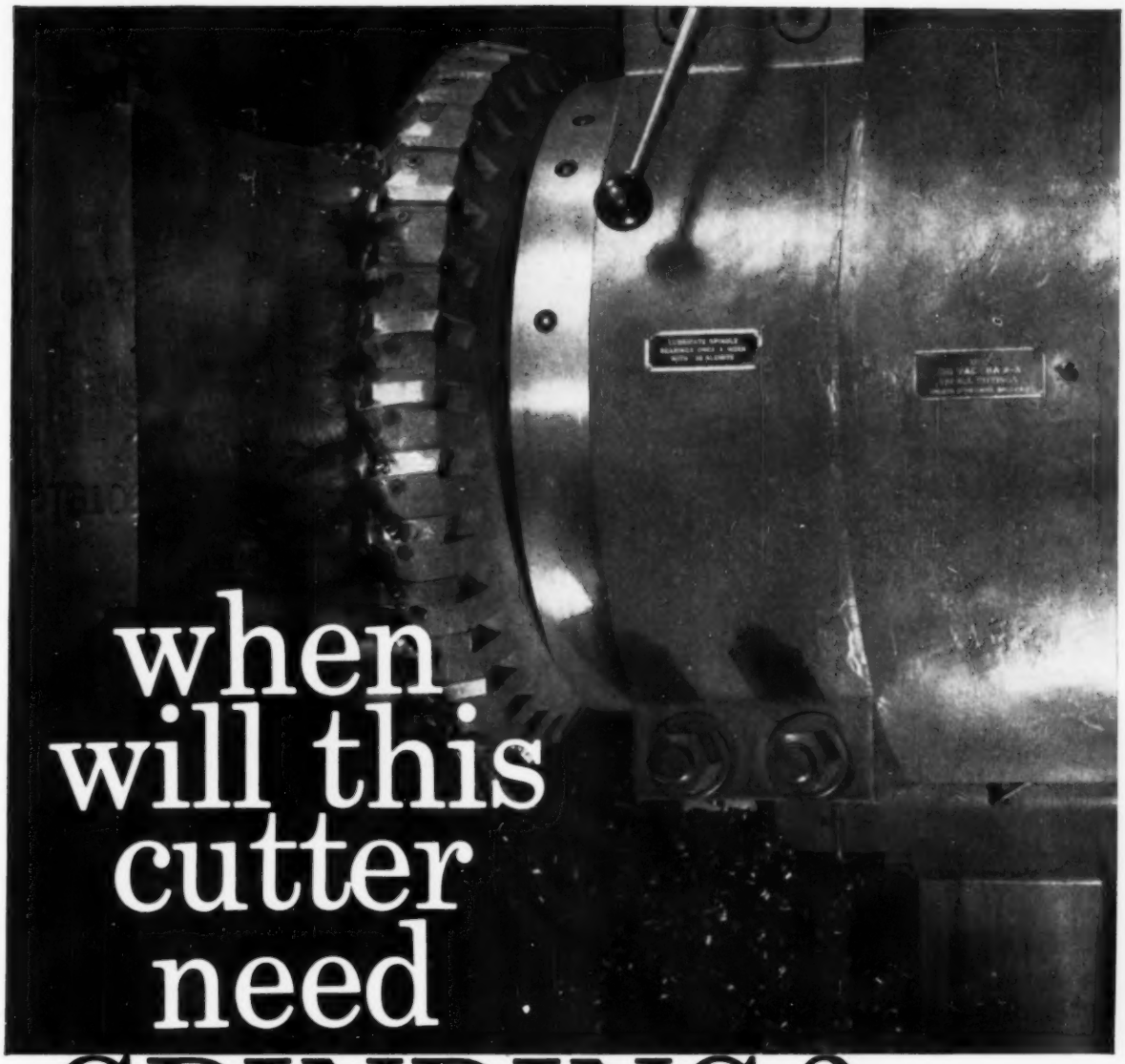
LEADER POINTS—another Allen exclusive (No. 8 and up) . . . helps speed assemblies.

In Cap Screws, there's no substitute for Allen Quality: 619 *standard* items . . . pressur-formd . . . for greater strength at vital points . . . with Class 3A threads, Class 2A above 1" dia.

Use **FLAT HEADS** for firm fastening with flush surfaces, No. 4 thru ¾" dia., lengths ¼" thru 2" . . . **BUTTON HEADS** for that streamlined look, without countersinking, No. 4 thru ¾" dia., lengths ½" thru 2" . . . **STAINLESS STEEL CAP SCREWS** for corrosion and heat resistance, high tensile strength; No. 0 thru ¾" dia., lengths ¼" thru 3". For complete details, see your local Distributor, or write Allen Manufacturing Company, Hartford 1, Connecticut.

ALLEN HEAD
HEX. SOCKET SCREWS

◀CIRCLE 298 READER SERVICE CARD



when will this cutter need GRINDING?

When the blades get dull, of course.

But when is a cutter blade dull? At what degree of dullness does it begin to consume increasingly more horsepower and produce inferior finish? At what point does grinding prolong blade life?

Knowing *exactly* when to grind cutters is just one of the many variables that vitally affect performance and costs.

Our specialty is working with these variables—to furnish the most economical solutions to milling and boring problems, including grinding techniques, through the use of inserted blade cutters.

We study machine, work piece, feed rate, depth of cut, speed and finish requirements. And only after pooling this information with the customer's specialized knowledge of his own work is any cutter recommended.

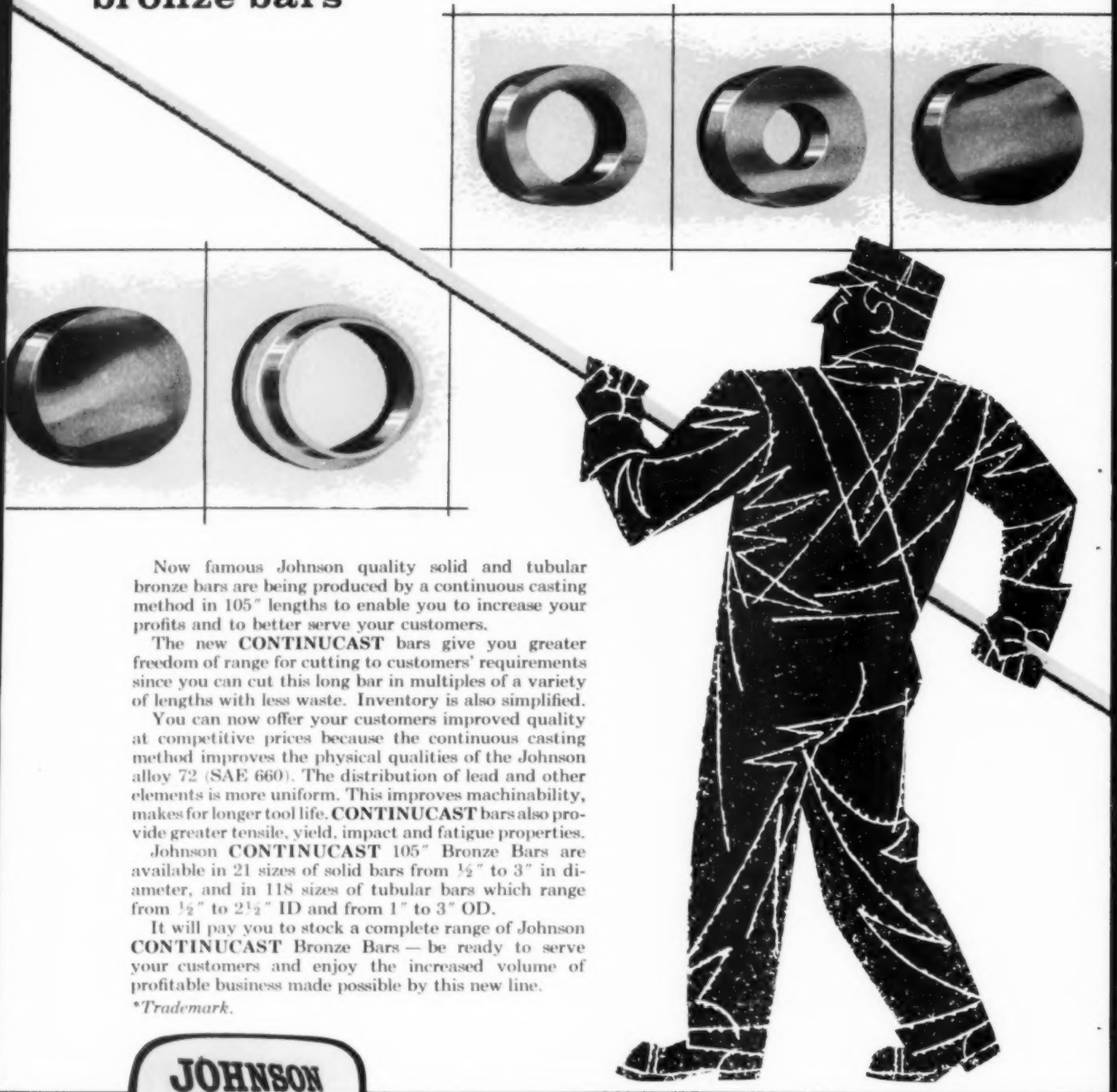
We would appreciate the opportunity to tell you more about this unique cutter selection service. Write:

This helpful new booklet tells you how to reduce the cost of chips and improve your milling and boring performance. Ask for a free copy of booklet No. 68K.

THE
INGERSOLL
MILLING MACHINE COMPANY
CUTTER DIVISION
505 FULTON AVENUE • ROCKFORD, ILLINOIS

CIRCLE 299 READER SERVICE CARD

NOW you get greater opportunity for profit, serve customers better with JOHNSON *Continucast** 105" bronze bars



Now famous Johnson quality solid and tubular bronze bars are being produced by a continuous casting method in 105" lengths to enable you to increase your profits and to better serve your customers.

The new **CONTINUCAST** bars give you greater freedom of range for cutting to customers' requirements since you can cut this long bar in multiples of a variety of lengths with less waste. Inventory is also simplified.

You can now offer your customers improved quality at competitive prices because the continuous casting method improves the physical qualities of the Johnson alloy 72 (SAE 660). The distribution of lead and other elements is more uniform. This improves machinability, makes for longer tool life. **CONTINUCAST** bars also provide greater tensile, yield, impact and fatigue properties.

Johnson **CONTINUCAST** 105" Bronze Bars are available in 21 sizes of solid bars from ½" to 3" in diameter, and in 118 sizes of tubular bars which range from ½" to 2½" ID and from 1" to 3" OD.

It will pay you to stock a complete range of Johnson **CONTINUCAST** Bronze Bars — be ready to serve your customers and enjoy the increased volume of profitable business made possible by this new line.

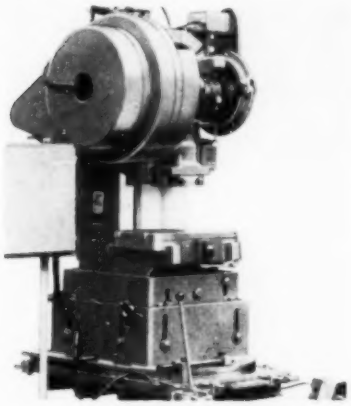
**Trademark.*

JOHNSON Bearings

Johnson Bronze

515 South Mill Street • New Castle, Pa.

Subsidiary: Apex Bronze Foundry Co., Oakland, Cal.



Flying Cut-off Press Reported to Increase Production Up to 100%

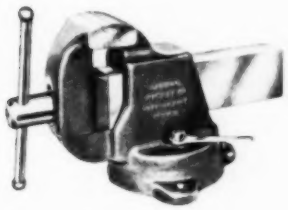
This flying cut-off press, when used with rolling mills, is said to increase production by as much as 100%

An air clutch control panel synchronizes the press with the speed of the mill and permits the cutting of metal channels, bars, angles, mouldings, and the like to any length

The press can be rotated 360° and it can be hydraulically tilted to form shapes It is available in any capacity up to 100 tons.

Federal Press Co, Elkhart, Ind

MORE DATA? Circle 113, inside back cover



Machinists Vise Added To Cardinal Line

Speed-Vise, designed for rugged bench work, incorporates the same quick acting screw principle as is used in company's line of drillpress vises. Screw cannot slip while nut is in positive clamp position, but will release instantly with a half turn.

On placing a piece in the vise, the screw is loosened by a half turn and jaw is free to slide to full opening. Jaw is then pushed up to the piece, dropped into place and locked with a half turn.

Cardinal Machine Co, 1819 Dana St, Glendale, Calif

MORE DATA? Circle 114, inside back cover

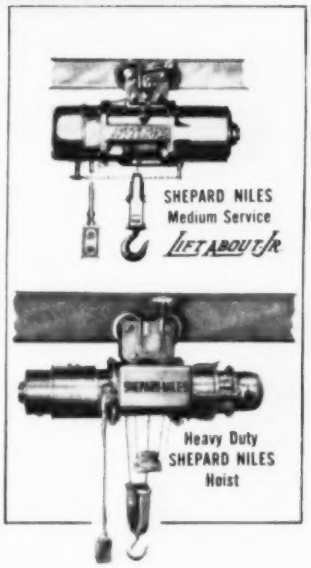
SHEPARD NILES HOISTS

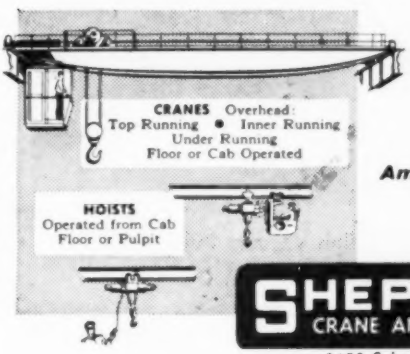
YEARS of SERVICE
WITH TROUBLE-FREE PERFORMANCE

You can be certain of years of thrifty, dependable service when you invest in a Shepard Niles hoist. Long after you have written off the original cost, your Shepard Niles hoist will still be speeding raw materials and work-in-process through the air.

Choose from medium and heavy duty capacities with slow, medium or fast speeds . . . built for cycle duty, heavy intermittent duty, medium duty and light occasional service . . . available with short to long lifts, standard or close headroom, manual or magnetic controls.

Send for illustrated Hoist bulletin today . . . or ask that a Shepard Niles representative call—there's NO OBLIGATION.

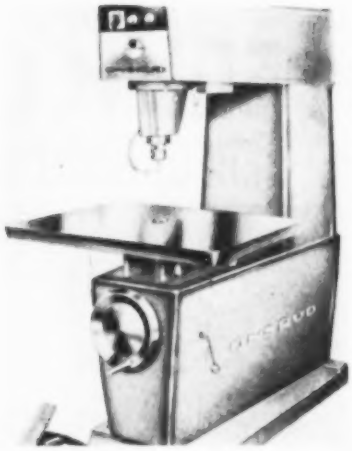




Building America's Most Complete Line of Cranes and Hoists Since 1903

SHEPARD NILES
CRANE AND HOIST CORPORATION
3193 Schuyler Ave., Montour Falls, N. Y.

CIRCLE 301 READER SERVICE CARD



Heavy Duty Routers Machine Nonferrous Metal Parts

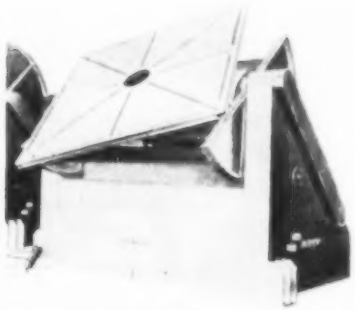
Heavy duty routers, designated 1024 and 1036, are designed for machining aluminum, magnesium and similar nonferrous metal parts. These high speed machines feature modern design, easier tooling and set-up and simplified operation.

The entire machine stand (bed, column and overarm) is a one-piece casting. Standard tables are adjustable vertically and optional table provides tilt up to 45°. Spindle speeds are 10,000 or 20,000 rpm.

Design details include spindle lock, air nozzle, and vacuum pulley drive.

Onsrud Machine Works, Inc, Niles 48, Ill

MORE DATA? Circle 115, inside back cover



Welding Positioner Handles Workpieces Up to 85,000 lbs

This welding positioner is designed to handle weldments up to 85,000 lbs at 12-in. center of gravity location from the workplate. It provides 90° forward tilt and 45° back tilt for either manual or automatic welding.

The Model G850 gear-driven positioner has four selective variable speed ranges for rotating small workpieces at 0.4 rpm and large workpieces as slow as 0.006 rpm.

Only 93.6 sq ft of floor space is required for the positioner which has its horizontal axis 85 in. above the floor.

Some of the types of weldments that can be handled are turbine assemblies, heat exchangers, submarine hull sections, furnace bells and hoppers.

Aronson Machine Co, Arcade, NY

MORE DATA? Circle 116, inside back cover

Bulk Materials Feeder Adapted For Bulk Parts Operation

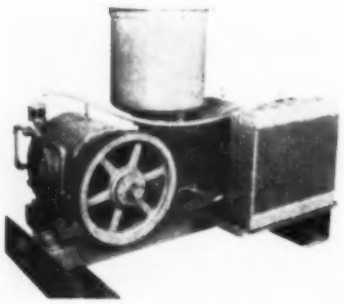
Electromagnetic vibrating feeders, a type used to feed bulk materials, have been adapted for rate-controlled feeding of bulk parts.

The electromagnetic drive which produces 3600 smooth vibrations a minute is said to result in very dependable movement of parts. Vibrations are controlled by a rheostat.

In addition to metal parts the feeder will also handle wood, plastic, rubber and similar materials.

Syntron Co, 511 Lexington Ave, Homer City, Penna

MORE DATA? Circle 117, inside back cover



High Vacuum Pump Unit Has 6 Sets of Dual Vanes

Model 106 high vacuum pump unit has sets of dual vanes to provide positive high pressure oil seal. It is

ACCEPT NO SUBSTITUTE

MEEHANITE CASTINGS ARE MADE ONLY BY MEEHANITE FOUNDRIES

The American Laundry Machinery Co., Rochester, N. Y.
Atlas Foundry Co., Detroit, Mich.
Banner Iron Works, St. Louis, Mo.
Barnett Foundry & Machine Co., Irvington, N. J.
Blackmer Pump Co., Grand Rapids, Mich.
E. W. Bliss Co., Canton and Toledo, Ohio and Hastings, Mich.
Centrifugally Cast Products Div., The Shenango Furnace Co., Dover, Ohio
Compton Foundry, Compton, Calif.
Continental Gin Co., Birmingham, Ala.
The Cooper-Bessemer Corp., Mt. Vernon, Ohio and Grove City, Pa.
Crawford & Doherty Foundry Co., Portland, Ore.
Dayton Casting Co., Dayton, Ohio
Empire Pattern & Foundry Co., Tulsa, Okla. and Bonham, Texas
Florence Pipe Foundry & Machine Co., Florence, N. J.
Fulton Foundry & Machines Co., Inc., Cleveland, Ohio
General Foundry & Mfg. Co., Flint, Mich.
Georgia Iron Works, Augusta, Ga.
Greenlee Foundries, Inc., Chicago, Ill.
The Hamilton Foundry & Machine Co., Hamilton, Ohio
Hardinge Company, Inc., New York, N. Y.
Hardinge Manufacturing Co., York, Pa.
Johnstone Foundries, Inc., Grove City, Pa.
Kanawha Manufacturing Co., Charleston, W. Va.
Kennedy Van Saun Mfg. & Eng. Corp., Danville, Pa.
Koehring Co., Milwaukee, Wis.
Lincoln Foundry Corp., Los Angeles, Calif.
Nordberg Manufacturing Co., Milwaukee, Wis. and St. Louis, Mo.
Palmyra Foundry Co., Inc., Palmyra, N. J.
The Henry Perkins Co., Bridgewater, Mass.
Pohlman Foundry Co., Inc., Buffalo, N. Y.
Rosedale Foundry & Machine Co., Pittsburgh, Pa.
Ross-Meehan Foundries, Chattanooga, Tenn.
Sonith Foundries of FMC, Indianapolis, Ind.
Standard Foundry Co., Worcester, Mass.
The Stearns-Roger Mfg. Co., Denver, Colo.
Vulcan Foundry Co., Oakland, Calif.
Washington Iron Works, Seattle, Wash.
Dorr-Oliver-Long, Ltd., Orillia, Ontario
Hartley Foundry Div., London Concrete Machinery Co., Ltd., Brantford, Ontario
Otis Elevator Co., Ltd., Hamilton, Ontario

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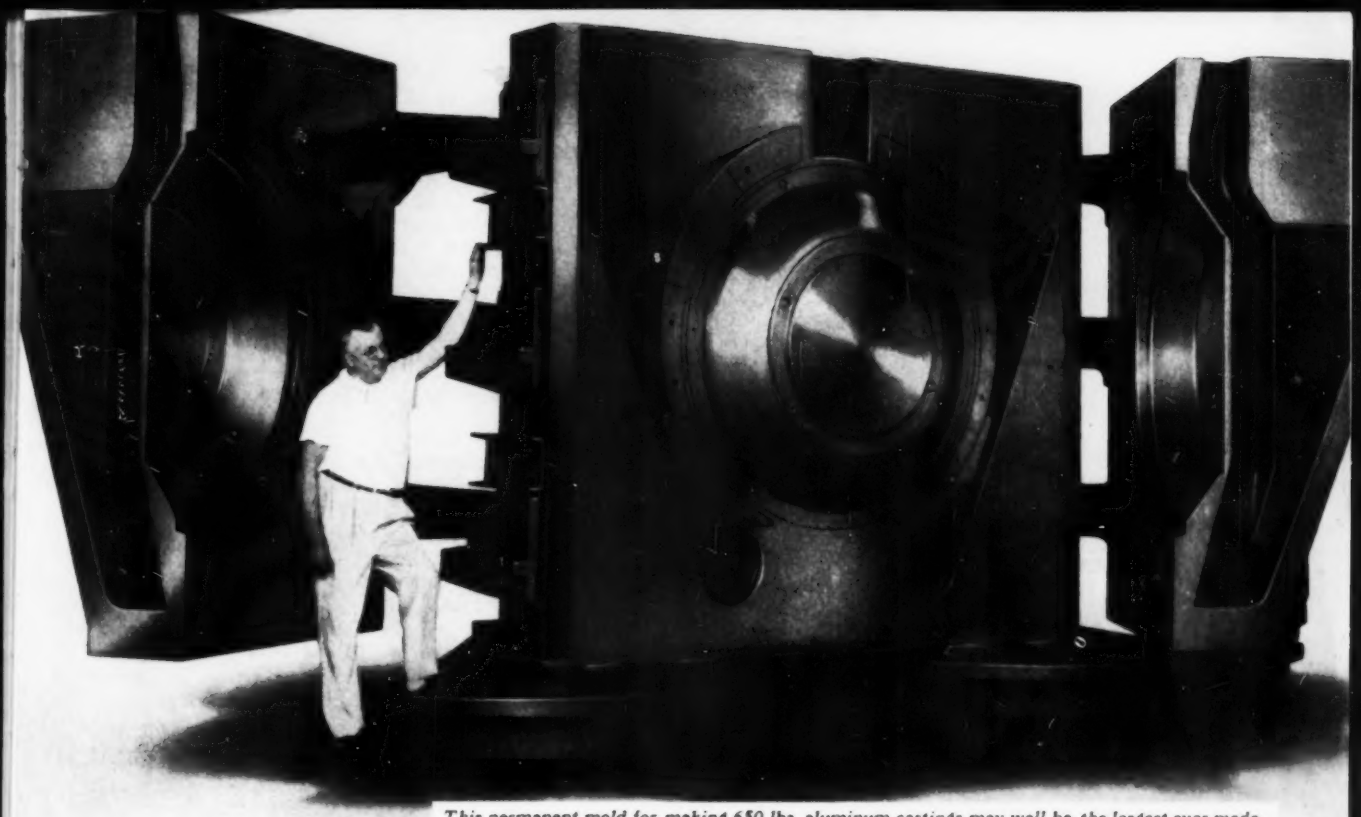
Bulletin 23 — "Meehanite® — The Metal For Permanent Molds."

Write today to Meehanite Metal Corporation, Department 5E, 714 North Avenue, New Rochelle, New York.

MEEHANITE®

CIRCLE 302 READER SERVICE CARD



This permanent mold for making 650 lbs. aluminum castings may well be the largest ever made. Cast in type GA, Meehanite metal by Fulton Foundry & Machine Co., Inc. of Cleveland, Ohio, it weighs 25-tons assembled.

Meehanite permanent molds offer resistance to heat checking and distortion from thermal shock.

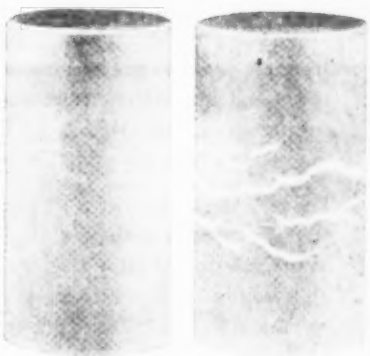
Premature cracking or disintegration of surface is a serious problem to the users of permanent molds. Severe service conditions demand the selection of a metal with a dense close-grained structure which maintains dimensional accuracy and resists the disastrous effects of thermal shock.

Meehanite metal has the ability to more than meet these requirements and is used extensively for permanent molds in the production of both ferrous and non ferrous castings, glass, plastics and other materials. The huge mold illustrated is proof of the confidence placed in Meehanite.®

The chief advantage of a Meehanite mold is consistent uniformity of structure throughout the casting. Meehanite's dense, stabilized structure resists thermal shock, insures freedom from distortion and dimensional changes. Easily machined, it provides the smooth, highly polished surface so essential to good finish and long production life.

Meehanite molds can be cast closely to shape to reduce machining operations. Also, they may be heat treated or flame hardened where high hardness is required.

Write for free literature: Bulletin 23 — "Meehanite® — The Metal For Permanent Molds."



The block on the right reveals what happens when an ordinary permanent mold material is suddenly heated and cooled. The Meehanite block on the left, given same test, shows complete freedom from surface cracking.

MEEHANITE BRIDGES THE GAP BETWEEN CAST IRON AND STEEL®

MEEHANITE METAL

MEEHANITE METAL CORPORATION, NEW ROCHELLE, NEW YORK

CIRCLE 303 READER SERVICE CARD

They are made to provide smooth, more efficient transmission of power and are available from stock in 13 sizes with bored or solid hubs ranging from .375" to 4.000". Special bores, bores with keyways or setscrews are available upon special order.

The close limits to which all parts are held assure maximum load carrying capacity with durability and long life. All parts are made of preheat-treated alloy steel and are precision ground to insure high quality and interchangeability of components. Joints with hub diameters of .750" and larger have a self-closing snap ball oiler while the small pin is held in place with a self-locking snap ring. The snap ring simplifies assembly and disassembly.

Send today for Bulletin No. 527 describing the full line of ASG Universal Joints available from your nearest distributor.

AMERICAN STOCK GEAR DIVISION
PERFECTION GEAR COMPANY HARVEY, ILLINOIS, U.S.A.

NEW SHOP EQUIPMENT

also equipped with a radiator oil cooling system.

The pump provides a steady vacuum of 29.9 in. Hg in continuous operation at an average temperature of 200 F and has a capacity of 50 to 105 cfm. Overall unit dimensions are 47 in. long by 36 in. high by 26 in. wide.

Leiman Bros., 102 Christie St, Newark 5, NJ

MORE DATA? Circle 118, inside back cover

Soldering alloy, Ambraze 4300, is recommended for high capillary joining of steel, nickel, stainless, copper, monel, aluminum bronze, beryllium copper, Elkonite, and aluminum, or any combination of these metals. Finished joint can be chrome-plated Usable with torch or soldering iron, material is said to offer excellent corrosion resistance. Melting point is 425 F; tensile strength, 14,000 psi; available in 1/16, 3/32, 1/8, 1-lb spools.

American Brazing Alloys Co, PO Box 11, Pelham, NY

MORE DATA? Circle 119, inside back cover

Metal protection process, tradenamed Trilac Process, protects metals from corrosion, scratching and die marking, and also provides superior lubrication during drawing and forming operations. Resins, applied from tricloroethylene solutions, give good adhesion and protection to ferrous and nonferrous metals during interior or exterior exposure. The materials, available in both permanent and non-permanent types, may be applied by cold- or hot-dipping, flow coating, spraying, or brushing.

Marketed by Chemical Mfg Co, 444 Madison Ave, New York, NY

MORE DATA? Circle 120, inside back cover

"He says it's fortified soup."

Comparative Tests Prove . . .

Sunvis 900 Oils have years of useful life under severe operating conditions

Versatile, long-lasting Sunvis® 900 oils are especially made to provide superior lubrication at high temperatures and in the presence of moisture. *They keep maintenance costs low.*

Time and again, when checked against new-oil specifications, used Sunvis 900 oils prove themselves fit for many more years of continued service, with *no* loss in performance features.

For example: The 3-year-old sample above was used in an injection molding machine operated for 40-48 hours per week at temperatures between 100 and 125 F. To see how the used oil compares with its original specifications look at the following table.

Specifications	New Sunvis 916	Sunvis 916 After 3 Yr*
API gravity at 60 F	30.5-32.5	30.3
Flash, open cup, deg F, min	400	400
Fire, deg F, min	460	460
Viscosity, SUS at 100 F	150-160	173.0
Viscosity index	90	90
Neut. number	0.10	0.05
Color, ASTM	1-1.5	3.5

*Typical Test

HOW TO GET MORE INFORMATION

Call your Sun representative, or write for Technical Bulletin No. 35, Sun Oil Company, Philadelphia 3, Pa., Dept. I-7.

INDUSTRIAL PRODUCTS DEPARTMENT

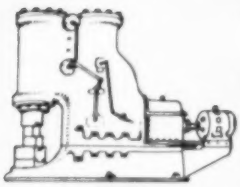
SUN OIL COMPANY

PHILADELPHIA 3, PA.

© SUN OIL CO.

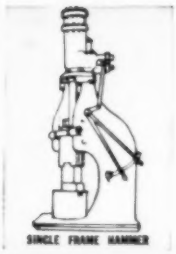
IN CANADA: SUN OIL COMPANY LIMITED, TORONTO and MONTREAL

SUNOCO



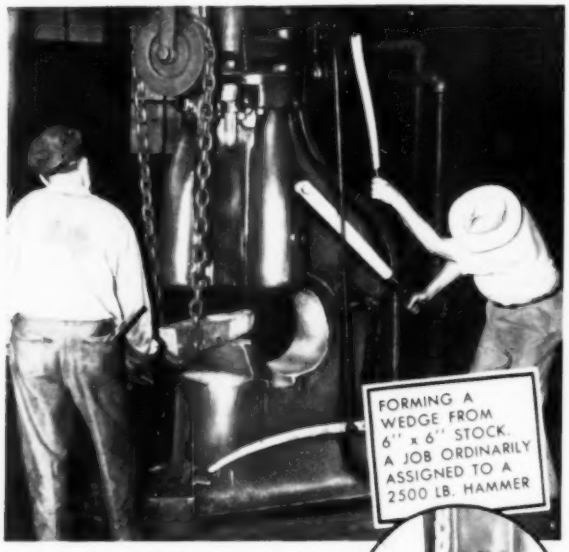
PNEUMATIC FORGING HAMMER

A Chambersburg Flat Die Hammer will save time and money ..



SINGLE FRAME HAMMER

A 200 lb. Chambersburg Motor Driven Pneumatic Hammer—Self-contained

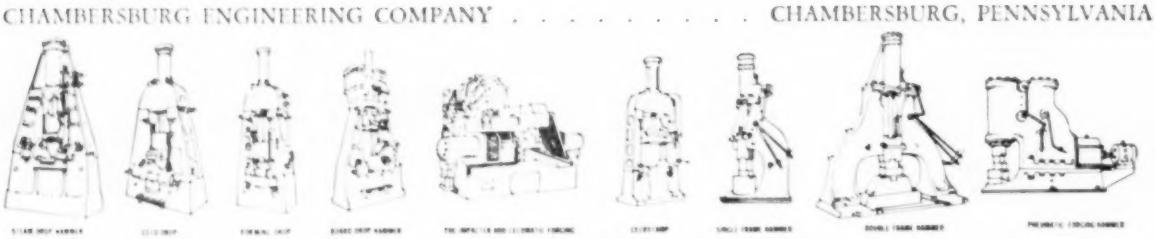


A 400 lb. Chambersburg Single Frame, General Utility Hammer (Steam or Air)

A small or moderate size flat die hammer is a great convenience for any shop where machinery repair or maintenance work is carried on. You can save time and money and often make a better repair part than you can buy, or make by casting or welding. When you need a replacement part in a hurry, or an emergency job of even unusual size, that's where a Chambersburg hammer will pay for itself. If you have steam or air available, a single frame steam hammer will be your logical choice. If not, a Chambersburg pneumatic, with motor, compressor and hammer in one, will be your best bet. Write for complete information.

CHAMBERSBURG • The Hammer Builders

CHAMBERSBURG ENGINEERING COMPANY . . . . . CHAMBERSBURG, PENNSYLVANIA



Stock Lifters Cut Cost and Time In Building of Progressive Dies

Known as Kenville stock lifters, these ready-made units can be installed by simply drilling two holes and tapping one. Merely drop the lifter and its spring into one hole and secure it with the socket-head retaining screw in the tapped hole. Stock lifters are available in three styles to handle stock up to 3/32 in. thick. Prices range from $3.97 to $5.63 per lifter.

Detroit Die Set Corp, 2895 W Grand Blvd, Detroit 2, Mich

MORE DATA? Circle 121, inside back cover

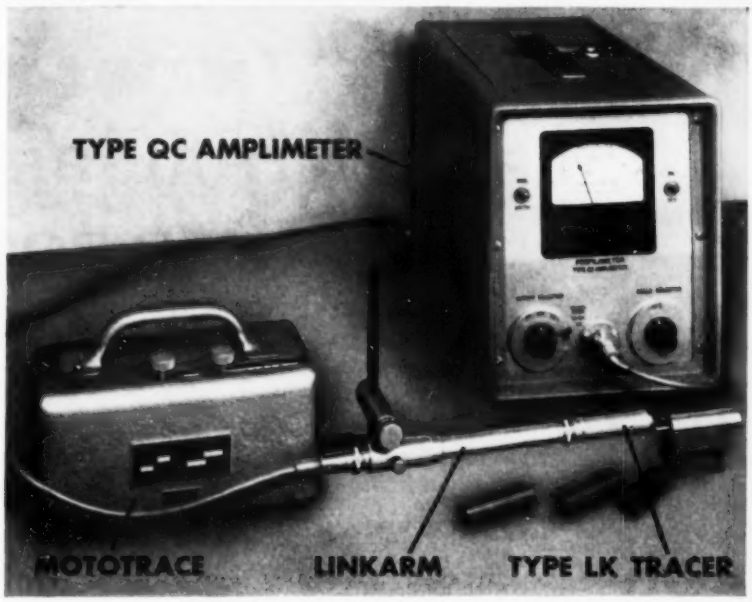
Surface-Temperature Meter Reads Ambient or Relative Temps

Pyrotem, for making ±2% full-scale accuracy measurements, is available in two types: automatically compensated for ambient temperature, or non-compensated for relative temp readings.

Model DTF, illustrated, is a compensated type available in ranges 0-300, 0-450, and 0-650 F. Non-compensated type, Model ETF, is furnished in the 0-200 C range only. Special 15° side-reading probe for hard-to-reach surfaces such as those of resistors and capacitors on par-

(Continued on page 202)

NEW! Profilometer® GROUP III



Measures Roughness of Surfaces from 1/8" to Flat — ID and OD

THIS shop equipment handles an exceptionally wide range of roughness measurement—with *proven Profilometer accuracy.* It is lightweight and portable — built for use by shop personnel — and includes the following items:

NEW Type LK Tracer — Measures on ID's and OD's as small as 1/8" — flats — tapers — narrow splines — gear teeth. Passes through a 3/4" hole.

NEW Type QC Amplimeter — Shows roughness from 0 to 1000 microinches (arithmetical or r.m.s.) on an easy-to-read meter. Has 3 standard roughness width cutoffs. Factory-calibrated for dependability.

Mototrace and Linkarm — Give the Tracer a steady support and smooth motion, essential to dependable measurement. No operator skill required.

FREE LITERATURE gives details. Write for it. And, without obligation, let us arrange for a demonstration in your plant. We have representatives in principal industrial centers throughout the Free World.

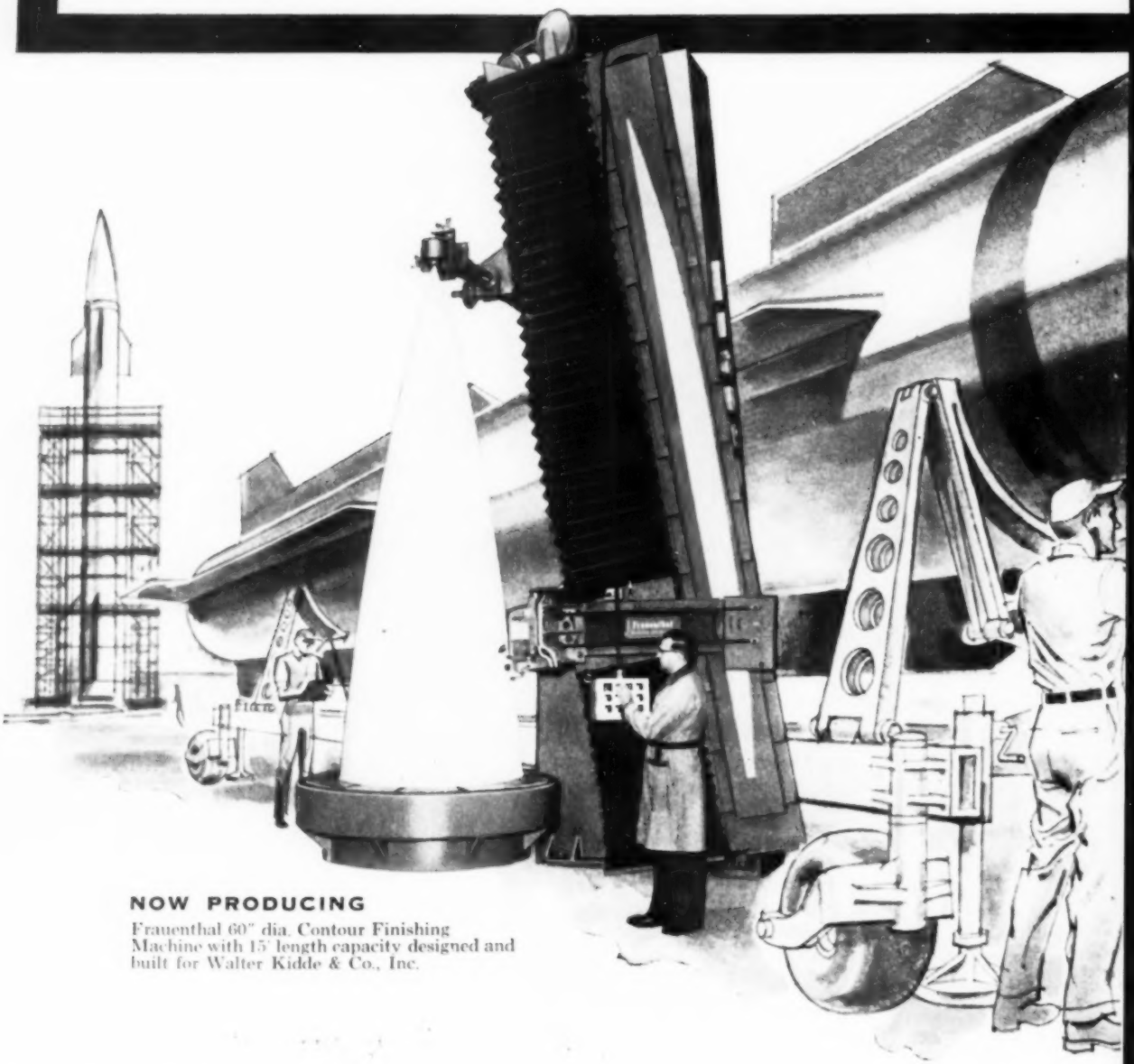
Remember: You can DEPEND on the PROFILOMETER — first in surface roughness measurement since 1936.

Profilometer is a registered trade-mark.

MMC®
MICROMETRICAL MANUFACTURING COMPANY
351 S. MAIN ST. ANN ARBOR, MICHIGAN

NEWS!

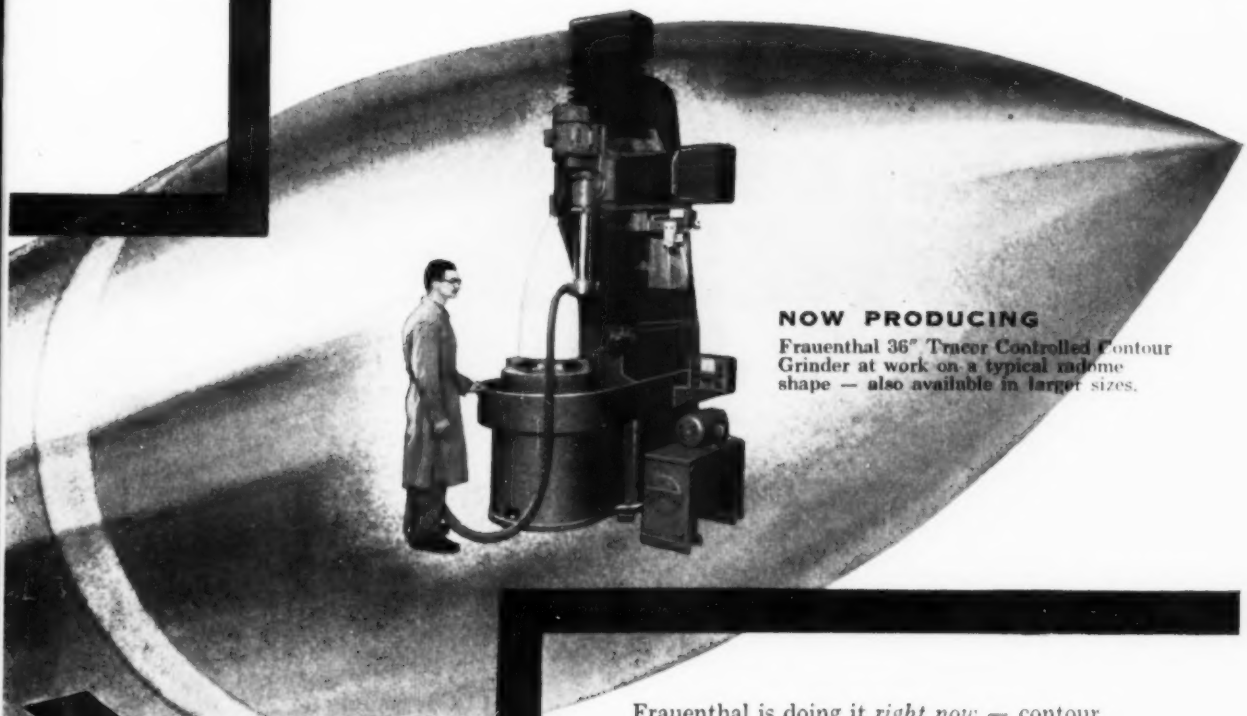
FRAUENTHAL BREAKS ANOTHER ROCKET-AGE MACHINING BARRIER



NOW PRODUCING

Frauenthal 60" dia. Contour Finishing Machine with 15' length capacity designed and built for Walter Kidde & Co., Inc.

Now... machining and grinding nose cone and radome contours for aircraft and I. C. B. M. re-entry missiles . . . FRAUENTHAL Rocket-Age machines are here!



NOW PRODUCING

Frauenthal 36" Tracer Controlled Contour Grinder at work on a typical radome shape — also available in larger sizes.

NOW PRODUCING

Frauenthal Precision Contour Turning and Finishing Machine. Producing to accuracy of ± .0005 over entire 60" diameter contoured surface, with 4 RMS maximum finish on re-entry nose cone.

Developed for AVCO Research and Advanced Development Division on the Titan program.

Frauenthal is doing it *right now* — contour machining, grinding and micro-finishing metal, fiber glass and ceramic nose cones for America's Space-Age missiles.

These creatively designed machines can generate nozzle throat contours for rocket motors, lay up or wind resinoid bonded material on formed mandrels, contour turn and grind mandrels or other difficult-to-work shapes and materials.

Contact Frauenthal now for forward-thinking machine designs. You'll get advanced engineering that *anticipates* your current and future requirements. All to help you profitably BREAK THROUGH in your field of operations.

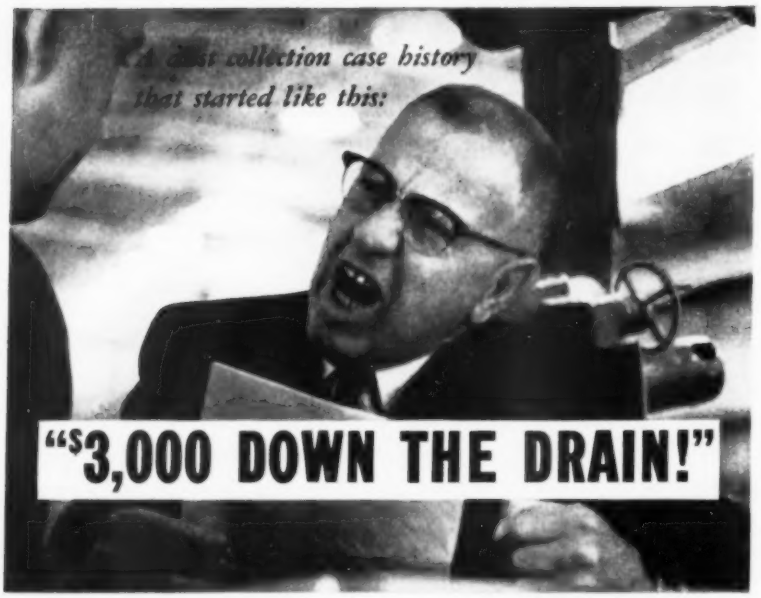
FRAUENTHAL

DIVISION

THE KAYDON ENGINEERING CORP.

MUSKEGON, MICHIGAN, U. S. A.

CIRCLE 309 READER SERVICE CARD



"Get rid of that DUST!"

"The boss was sore and I was on the spot.

"He shoved the report from the efficiency engineer at me. I read it: 'Yearly loss due to machine wear, misalignment and down time . . . $3,000. Major cause . . . abrasive dust.'

"The boss pointed his finger at me, 'Get rid of that dust and get rid of it fast!' "

Now, it was my problem, and I was on the spot.

"First thing I did was to check into a central dust collecting system. But the lowest bid I could get was $8,000. Too much.

"Then I came across a Torit ad, offering economical portable dust collectors.

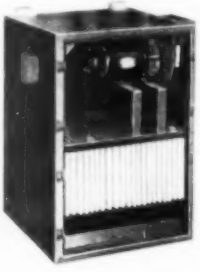
"Two days after my call Torit engineers showed me how in only one week they could install a portable, unitized Torit Dust Collector at each of our eight grinders, trapping dust right at its source—cleaning the air throughout the entire plant.

"Total cost? Only $2400.00. That's a $5,600.00 saving over the lowest priced central system.

"You guessed it—we installed the eight Torit Collectors."

Torit solved my problem

"This year when we received our report it read: 'Loss due to machine wear, misalignment and down time...$340.00.' A saving of $2,660.



"This time the boss was all smiles. He slapped me on the back, 'Charlie, you did a fine job getting rid of that dust. Frankly, I didn't think it could be done with such a small investment.'

"Now there's a pretty nice fellow to work for.

"If you've got a dust problem, or are about to have one, write the Torit people. They've manufactured and sold more dust collectors than anyone else in the U.S.A. Chances are they can help you the way they helped us."

TORIT manufacturing company

Dept. 411, Walnut & Exchange Sts., St. Paul, Minn.

allel mounting boards, makes the instrument particularly useful for checking operating temperatures of electronic components. Price of Model ETF is $44.50; DTF 0-450 and 0-650 are $59.50, and DTF 0-300 is $89.50.

Royco Instruments, Inc, 87½ Fabian Way, Palo, Alto, Calif

MORE DATA? Circle 122, inside back cover

Bronze brazing alloy, degasified and deoxidized for extremely low fuming characteristics, is designed for general purpose welding work, especially fusion welding and surface build-up. It is available in both bare and flux-coated form.

Dalweld Co, Inc, 13 Bertel Ave, Mt Vernon, NY

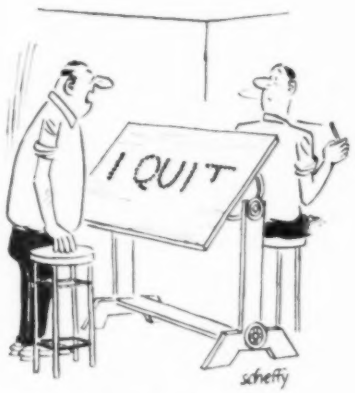
MORE DATA? Circle 123, inside back cover

Carbide boring bars feature solid-carbide heads, permitting extensive resharpening for maximum tool life. Constant clearance throughout the life of the tool is assured because the tool is sharpened by grinding only the cutting face. Ideally suited for working the harder steels, alloys and cast metals, the tools are available in sizes from ⅛ to ¾ in., in shank sizes of ⅜ to ½ in., and with tips ground for boring or facing.

Titan Tool Supply Co, Inc, 1419 Hertel Ave, Buffalo 16, NY

MORE DATA? Circle 124, inside back cover

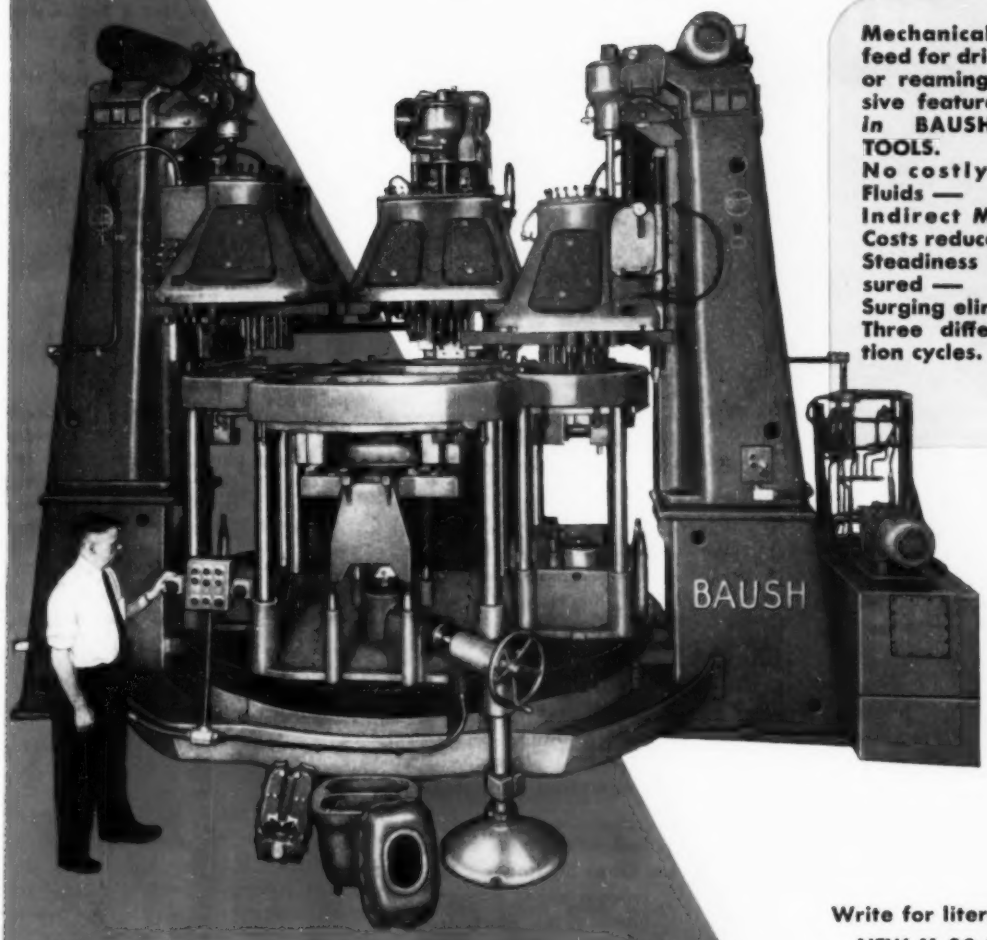
Portable power unit of high capacity, named Pack-Horse, is designed for use with all types of hydraulic components and is especially suitable for standby power source. This compact



"Got any more thumbtacks?"

VERSATILE MECHANICAL LEADSCREW MACHINE

With Master Fixture Holding Units and Mounting Plates, Drills, Taps and Reams 39 Different Parts of Gas Meter Accurately and Economically



Mechanical Leadscrew feed for drilling, tapping or reaming is an exclusive feature *found only in* BAUSH MACHINE TOOLS.
No costly Hydraulic Fluids —
Indirect Maintenance Costs reduced —
Steadiness of feed insured —
Surging eliminated —
Three different production cycles.

SPECIFICATIONS:

Each of three vertical columns mounts an M-20 Mechanical Leadscrew Machine. The 124" diam. Semi-Automatic Hydraulic Rotary Indexing Table has four stations. M-20 Units are mounted at Stations 2 - 3 and 4. Each head is 27" x 40" and is bored for 32 spindles with 32 upper spindle drivers 1½" in diam. arranged for 2 speeds and a neutral position. Both feed and spindle speed are variable . . feed can be varied from .005 per Rev. Low to .090 per Rev. High, and spindle speeds from 130 RPM to 1050 RPM.

Feed is thru ball screw direct from spindle driving gears. When a head goes from rapid traverse to feed stroke an electric brake holds leadscrew and shuts off traverse motor — saving wear and tear. Heads have automatic high production cycle — semi-automatic low production cycle, and a jog cycle for set-up. Machine has 98 spindles and adjustable arms. Operation sequence is:

Station 1 — Unload and load
Station 2 — Multiple Drilling
Station 3 — Multiple drilling, chamfering and reaming.
Station 4 — Multiple Tapping (Master Leadscrew Method)

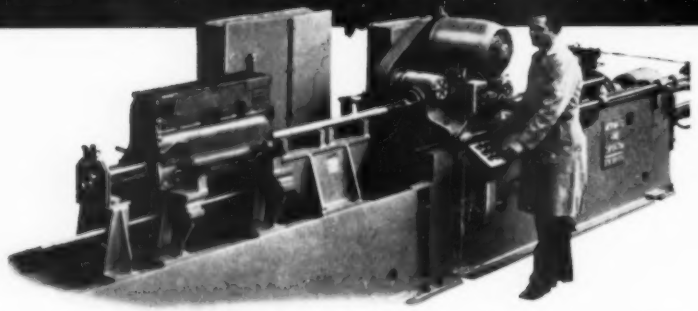
Machine has:

3 — 20 HP 1800 RPM motors for spindle drives
3 — 1 HP 900 RPM motors for Rapid Traverse Heads
1 — 7½ HP 1200 RPM motor operating Rotary Table.

Write for literature on this NEW M-20 MECHANICAL LEADSCREW machine NOW. Send us your problems — our Engineers can help you.

BAUSH
MACHINE TOOL CO.
SPRINGFIELD 7, MASSACHUSETTS

WHY CUMMINS main bearings are MICROHONED

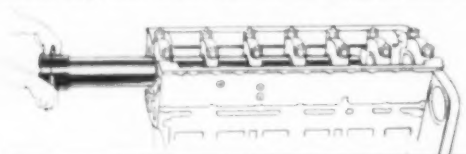


"Cummins diesel engines have a world-wide reputation for dependable, low-cost power. Here at Cummins, we attribute the wide acceptance of our engines to constant searching for better processing methods and improved engine performance.

"For example, if our crankshaft main bearings were undercut at the ends, tapered or out-of-round, then the full load of the journals would be borne by relatively small areas. This would cause bearing inserts to overheat and quickly break down. Also, should the bearings be misaligned, the crankshaft would flex during rotation and cause fatigue failure.

"However, by Microhoning our main bearings we secure *round, accurately-sized* and *aligned bores*. Cummins is the first diesel manufacturer to Microhone its main bearings. The surfaces of Microhoned bearings are clean-cut, free of deformed metal and the finish is consistent in every bore. In addition, the consistent accuracy generated by Microhoning permits us to make faster set-ups and use higher cutting feeds on preceding boring operations—Microhoning automatically corrects all inaccuracies.

"After Microhoning, all main bearing bores are checked with a gage plug 44 inches long and .0007 inch under required bore size. Gage must have a simultaneous slip-fit through all bores in the block. Tolerance for roundness is less than .0002 inch and finish is held to the specified 5.5 microinches."



Learn how Microhoning will give you efficient stock removal, closer tolerances, accurate alignment and functional surfaces.

Please have a Micromatic Field Engineer call.

Please send Micromatic literature and case histories.

NAME

TITLE

COMPANY

STREET

CITY ZONE STATE

MICROMATIC HONE CORP.

8100 SCHOOLCRAFT AVENUE • DETROIT 38, MICHIGAN

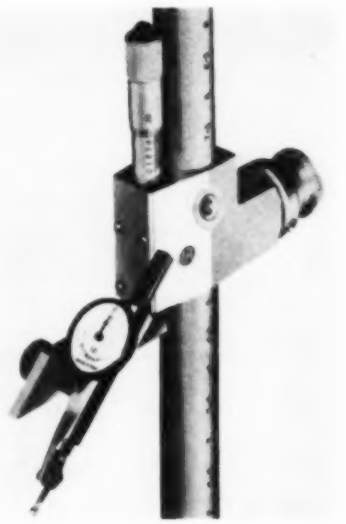
unit can be connected to any plant compressed air line. It weighs 250 lbs and measures 31 by 16 by 15 in. Pack-Horse has a capacity up to 3.5 gpm and provides pressures up to 3000 psi.

M B Sturgis, Inc, 601 S Taylor Ave, St Louis 10, Mo

MORE DATA? Circle 125, inside back cover

HEDLOC HAMMERS take interchangeable inserts furnished in lead, brass, nylon, and plastic. Worn inserts can be quickly replaced. Five hammer models are available weighing from ¾ to 8½ lbs; inserts are in sizes from ⅝ to 2 in.—*Burr & Nichols, Inc, 76 Railroad St, Keene, NH*

MORE DATA? Circle 126, inside back cover



Dial Indicator Increases Accuracy Of Micrometer Height Gages

A dial indicator comparator is used in conjunction with a built-in micrometer to increase height gage accuracy.

By manipulating the height gage micrometer thimble to offset deviations shown on the dial indicator,

90% of the error inherent in dial indicators is eliminated. Gages are available in 12 and 24 in. heights.

Foster Supplies Co, 6122 Milwaukee Ave, Chicago 46, Ill

MORE DATA? Circle 127, inside back cover

Welding electrode called Fleetweld 180 is designed for arc welding sheet metal and for general maintenance welding with small transformer welders. The E-6011 electrode can operate on currents as low 50 amps, making it possible to weld 0.036-in. (20 gauge) material without burn-through. It is available in 3/32-in., ⅛-in., and 5/32-in. sizes.

Lincoln Electric Co, Cleveland 17, Ohio

MORE DATA? Circle 128, inside back cover

Conveyor components can be easily assembled to make custom belt conveyors of any length in belt widths of 10, 14, 18, or 22 in. These E-Z-Bild components include straight intermediate sections, top curves, feeder sections, drives, take-ups, belts, idlers, floor supports and ceiling hangers.

Alvey-Ferguson Co, 3005 Disney St, Cincinnati 9, Ohio

MORE DATA? Circle 129, inside back cover

High-speed mechanical counter is a direct reading unit that can operate continuously at 6000 rpm. It incorporates a directly-geared second wheel which reduces the wear usually resulting from conventional transfer-pinion methods. Case is 2¾ in. long, 2 in. high, 1½ in. deep.

Veeder-Root Inc, Hartford 2, Conn

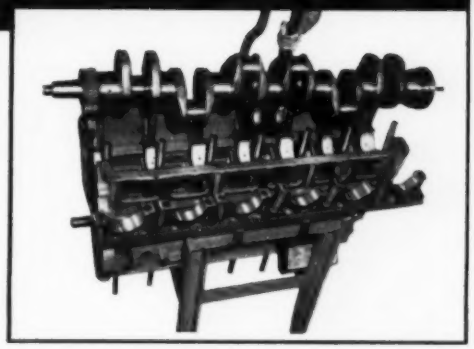
MORE DATA? Circle 130, inside back cover

Wear strip material is now available in a line of extruded rectangles, Amco grade 18. Depending upon rectangle size (available in 46 sizes), mechanical properties range from 100,000 to 108,000 psi in ultimate tensile strength, 50,000 to 55,000 psi in yield strength, and 200 to 230 in Bhn. Close tolerances provide max economy in finishing to required size.

Ampco Metal, Inc., 1745 S 38th St, Milwaukee 46, Wis

MORE DATA? Circle 131, inside back cover

HOW MICROHONING generates round, accurate, aligned bearing bores



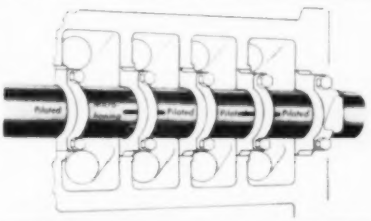
All types of cylindrical surfaces, including small diameters and combinations of soft and hard metals . . . interrupted by keyways, undercuts, ports, reliefs or cross holes . . . can be economically Microhoned to precision tolerances and alignment.

A typical example of Microhoning interrupted cylindrical surfaces is the Cummins Diesel Engine application. Here's how Microhoning generates accuracy and alignment in the crankshaft main bearing bores:

1. Cutting pressure is applied radially from the center of the Microhoning tool body. Abrasives and guides both are expanded by the same feed force, and wear at the same rate.

2. Abrading action is divorced from the effects of spindle or driveshaft vibration and misalignment by a universal joint that is between tool body and driveshaft.

3. The single bank of abrasives travels through all bores on every stroke. As abrasives are Microhoning one bore, the tool is piloted by the plastic guides in the other bores.



The principles and applications of Microhoning are thoroughly explained in a 16mm, 30-minute sound movie, "Progress in Precision". We'll be glad to reserve a print for your use.

☐ Please send me "Progress in Precision" in time for showing on _____ (date).

☐ Please send Microhoning literature; I am interested in the following application _____

NAME _____

TITLE _____

COMPANY _____

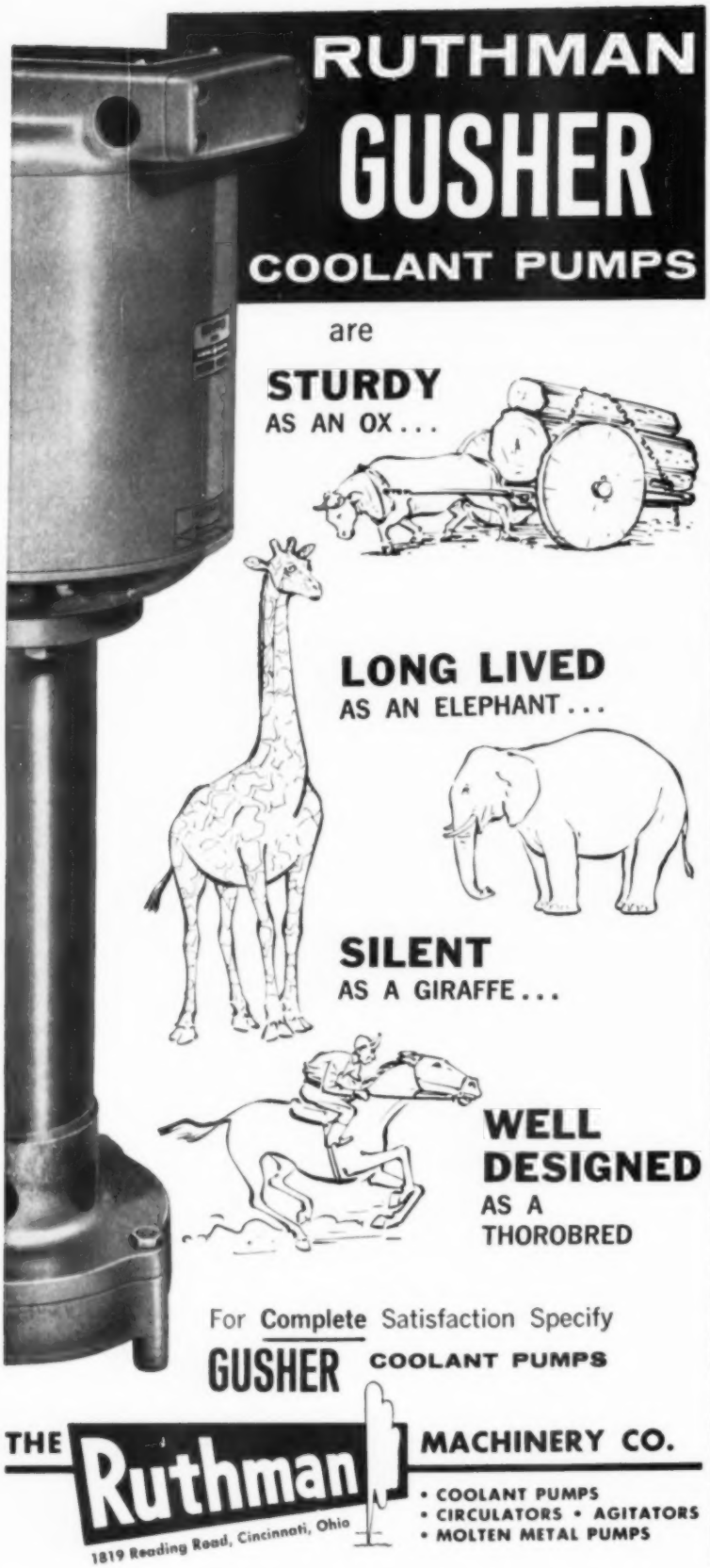
STREET _____

CITY _____ ZONE _____ STATE _____

MICROMATIC HONE CORP.

8100 SCHOOLCRAFT AVENUE • DETROIT 38, MICHIGAN

CIRCLE 313 READER SERVICE CARD



NEW SHOP EQUIPMENT

Solid film lubricant, designed to increase wear life of moving parts operating in oil or grease, contains small particles of lead, tin, and graphite which are well known for their ability as bearing materials. Semi-porous nature of No. 4856 absorbs oil and acts as a reservoir against metal-to-metal contact under high loads, and especially during long shutdown periods; it is also compatible with additives in oils and greases.

Electrofilm, Inc, PO Box 106, North Hollywood, Calif

MORE DATA? Circle 132, inside back cover

Rubberized abrasives for sensitive deburring, smoothing, and polishing jobs, are offered in Tool & Die Makers Kit 777. Compartmented plastic box contains 80 wheels and points equally assorted in four grit textures (coarse-C, medium-M, fine-F, extra fine-XF) and four mandrels for 1/8-in. chuck.

Cratex Mfg Co, 1600 Rollins Rd, Burlingame, Calif

MORE DATA? Circle 133, inside back cover

Boring bar is designed with two-piece drawbar construction that prestresses the bar, eliminating the normal deflection that takes place in application. Available in seven sizes, it is said to be particularly adaptable for bottom boring and internal threading.

W D Allen Mfg Co, 566 W Lake St, Chicago 6, Ill

MORE DATA? Circle 134, inside back cover

Dial indicator, with various scale graduations, measures 19½ in. in diameter. Larger size facilitates taking pressure readings.

A H Emery Co, Pine St, New Canaan, Conn

MORE DATA? Circle 135, inside back cover

High-speed stripper, Coldstrip 900, for room temperature removal of enamels, lacquers, and resin-base coatings, can be used in a steel, glass-lined, or ceramic tank.

Lea Mfg Co, 16 Cherry Ave, Waterbury 20, Conn

MORE DATA? Circle 136, inside back cover

CIRCLE 314 READER SERVICE CARD
CIRCLE 315 READER SERVICE CARD ▶

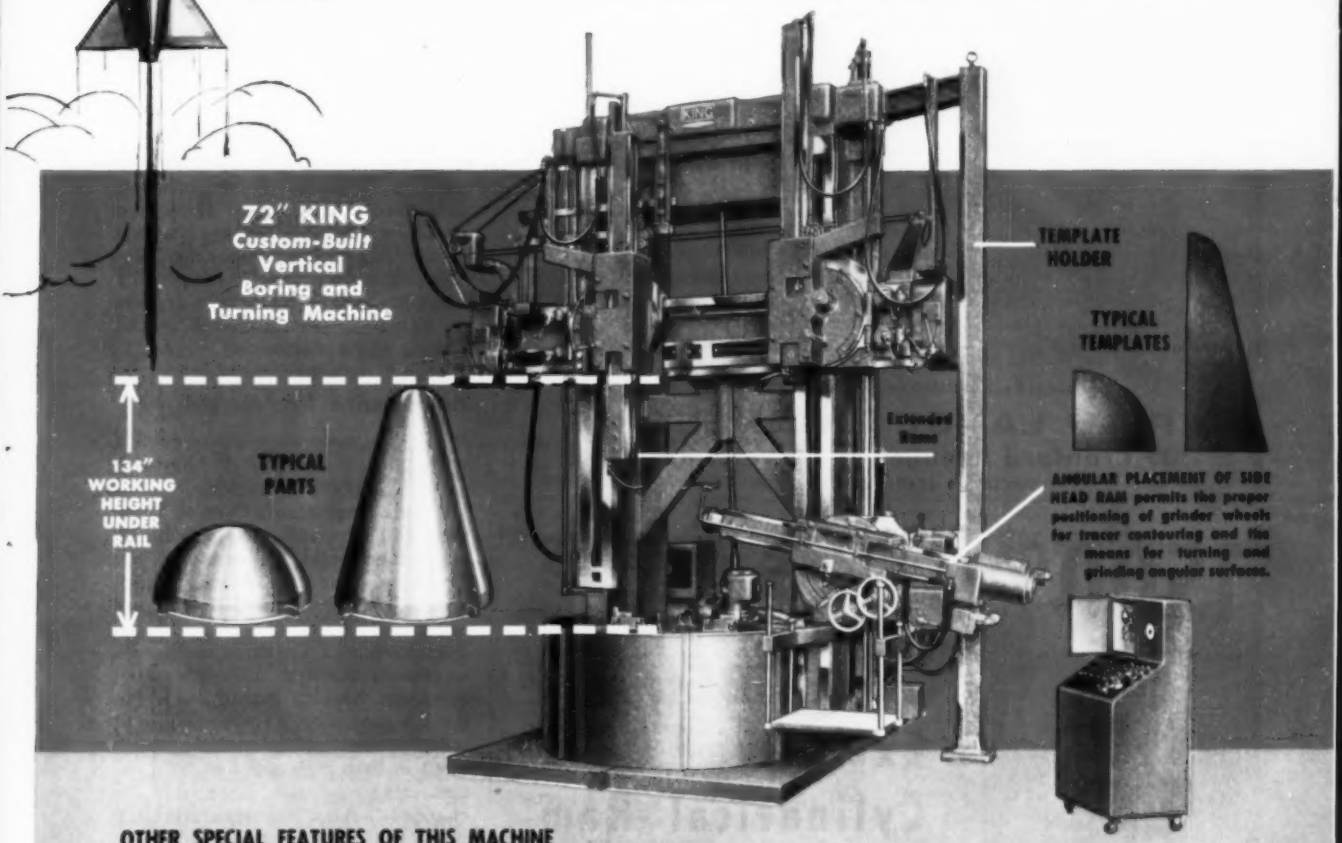
Another **KING** "Defense Production Special"

"Tailor-Made" to Specific MISSILE Requirements ...Yet Retaining All General-Duty Features

Recently installed in one of the nation's leading aircraft plants, this specially-built unit is a good example of the wide range of design versatility which is available in KING® Vertical Boring and Turning Machines.

When you buy a custom-designed KING machine, you buy only the accessory equipment, electrical controls, and design modification which your special-work machining operation requires—*no more and no less!* And always, you have in the basic machine all the standard facilities for general-purpose boring, facing, and turning.

This KING combination of special features and general-purpose facilities makes *all the difference* in competitive cost-control.


72" KING
Custom-Built
Vertical
Boring and
Turning Machine
TEMPLATE HOLDER
TYPICAL TEMPLATES
Extended Ram
134" WORKING HEIGHT UNDER RAIL
TYPICAL PARTS
ANGULAR PLACEMENT OF SIDE HEAD RAM permits the proper positioning of grinder wheels for tracer contouring and the means for turning and grinding angular surfaces.

OTHER SPECIAL FEATURES OF THIS MACHINE

- **Swiveling type side head** arranged for tracer controlled turning and grinding operations.
- **Grinding attachment** with multi-speed precision motorized spindle extending through side head ram and arranged to receive interchangeable quills. Attachment includes balancing type wheel holders and wheel guard with exhaust outlet.
- **3-position tool holder for side head,** which can be readily interchanged with grinder quills for turning operations.
- **Operator carrier platform attached to side head,**
- **Console control system.**
- **Electronic, two-dimensional (360°) tracer mounted on side head.** Template holder arranged to support templates of the type required for work pieces utilizing full capacity of the machine. Universal adjustment is provided for the tracer head.
- **Electronic, two-dimensional (360°) tracer mounted on rail head.** Template holder mounted on top of rail to provide maximum work clearance above table. Positioning controls for stylus head for operator convenience.
- **Constant surface cutting speed attachment and constant chip thickness controls** applied to both tracer heads.
- **Coolant** conducted through rail head rams.

For further details on KING machines—standard 30" to 144" designs or special custom-built units—see your authorized KING Distributor, or write to us direct.

AMERICAN STEEL FOUNDRIES, KING MACHINE TOOL DIVISION
1150 TENNESSEE AVENUE, CINCINNATI 29, OHIO

KING Vertical Boring and Turning Machines

NUTAP
Automatic NUT TAPPER

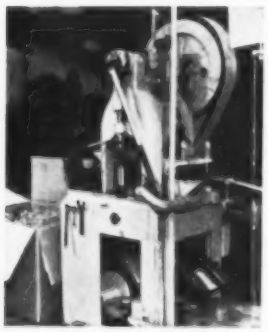
Taps nuts and screw machine parts automatically to close tolerances. Produces smooth, clean threads square to nut bearing surface. Maintains high production with minimum tapwear. Safety devices prevent tap breakage. Complete information available on request.

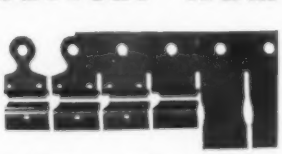
NUTAP *also manufactures*
NUT FACERS
NUT BURNISHING PRESSES
NUT COUNTERSINKING PRESSES
C. P. NUT PRESSES

General Representative in U. S. A. and Canada

ERICH LANGE ENGINEERING
1137 Cranford Avenue • Cleveland 7, Ohio
CIRCLE 316 READER SERVICE CARD

1500% *MORE PIECES* Per Die Sharpening on DIEBEL with Exclusive Cylindrical Ram





NEW METHOD produces 500,000 to 800,000 pieces per die sharpening with very little punch breakage and quality of pieces is better. Here is dramatic proof that DIEBEL'S exclusive cylindrical ram cuts die deflection to an absolute minimum.

5 Station die produces 500,000 to 800,000 calendar pencil clips per grind from .008" stock at Brown & Bigelow plant in Minneapolis.

OLD METHOD required three dies that had to be sharpened every 50,000 pieces. Punch breakage was high. It took two O.B.I. presses working two shifts to produce 25,000 pieces per day.

WHEN THIS PART was moved from an O.B.I. to a DIEBEL 12 Ton Hi-Production Automatic, production increased from 50,000 to as high as 800,000 pieces per grind with less punch breakage.

Sales Service Mfg. Co.
2361 University Avenue **St. Paul 14L, Minnesota**

FIELD REPORT...

Koehring Buys Cast-Master, Inc

Complete business of the Bedford, Ohio, builder of die casting machines has been acquired by Koehring Co, Milwaukee. Purchase price, involving an exchange of stock, was reported to be in excess of $1.5 million. Current plans call for continued operation of Cast-Master in its plant at Bedford as a division of Koehring's Hydraulic Press Mfg Division, Mount Gilead, Ohio.

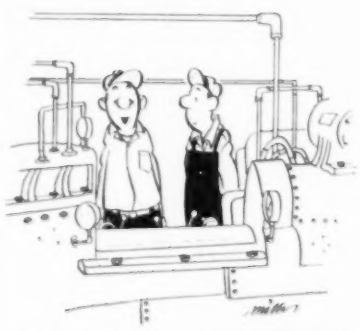
Jones & Laughlin Entering Electrical Steel Market

Company is taking orders for a series of new carbon electrical steels made in its basic oxygen furnaces. Steel sheets, tradenamed Jalox, are primarily designed for applications in the motor manufacturing field. Low sulfur and nitrogen contents of material made by the oxygen process are especially advantageous in the making of electrical steel.

Magnethermic-Ajax Merger

Merger has been negotiated between Magnethermic Corp of Youngstown and the Ajax Electrothermic Corp and Ajax Engineering Corp of Trenton, NJ, through acquisition by Magnethermic of the assets of the two Ajax companies. Subject to approval of stockholders, details are expected to be completed by May 1. Combination of the three companies represents the first fully integrated induction heating manufacturer in the US producing a complete line of induction heating and melting equipment in both high and low frequencies. Magnethermic name will be changed to Ajax Magnethermic Corp with the Ajax companies to be known as the Ajax Electrothermic

(continued on page 211)



"The nice thing about machinery is its simplicity. Anyone with a doctor's degree in thermonuclear physics can operate it!"

DIES TO WORK MICA AS PRECISELY AS THIS

require the critical inspection that only the Kodak Contour Projector provides.

SPECIAL HIGH-PRECISION DIES are needed to stamp out an intricate mica blank like this, used for positioning electronic tube elements.

Tolerances are on the order of ±0.0002". In making such dies the firm of Schneider and Marquard, Inc. (specialists in punches and dies for precision mica products) was not satisfied with the accuracy limitations of ordinary inspection methods, and turned to *optical* inspection.

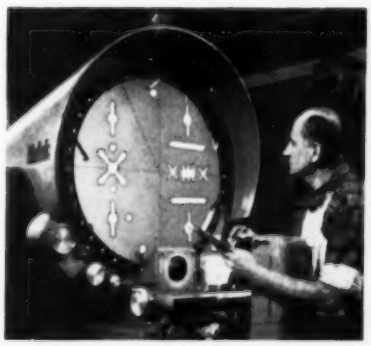
Even then, they found that only one instrument could provide the extremely precise degree of inspection needed, with unparalleled accuracy on all parts of the screen image. That instrument was the Model 30 Kodak Contour Projector.

Accuracy, plus . . . With this large-screen (30-inch) comparator you get a projected image that's as *free* from distortion as the science of optics will permit—accuracy on *every* inch of the viewing screen, including the very edges.

You get a sharp, high-contrast image that's erect and unreversed at all magnifications. Changes in magnification can be made at the flick of a switch.

More refinements . . . You also get efficient head-on surface illumination and a full 16" throat clearance between collimator lens and front mirror. This clearance is constant at *all* magnifications, permits staging of large parts without repositioning. The many other advanced refinements, extreme optical stability, and rugged construction of the Model 30 Kodak Contour Projector make it a leading choice for large-screen precision micrometry or routine gaging.

Cut inspection costs . . . Along with accuracy, optical gaging with Kodak Contour Projectors offers you savings in tool costs, increased inspection rates, and the economies that result from a minimum of operator training.



You can use optical gaging almost anywhere in your plant . . . receiving, assembly, production, inspection, or toolroom. There are 6 Kodak Contour Projectors to choose from, one matched to your inspection needs.

Get all the facts. Write to:

Special Products Sales

EASTMAN KODAK COMPANY, Rochester 4, N. Y.

the KODAK CONTOUR PROJECTOR

Kodak
TRADE MARK

CIRCLE 318 READER SERVICE CARD

INTRICATE SHAPES, PRECISELY FORMED IN 2 TO 10 MILLISECONDS

By DYNAPAK, a breakthrough in high-energy-rate metal working equipment

Pneumatically energized DYNAPAK, industry's first high-energy-rate machine tool, has produced the shapes pictured here, and many others of equal intricacy. DYNAPAK is equally applicable to extrusion, forging, forming, or compaction. DYNAPAK offers energy outputs from 40,000 to 1,500,000 foot-pounds – tool speeds to 2500 inches per second, controllable to ±12 inches per second. Elapsed time from billet to finished piece, 2 to 10 milliseconds, is so brief as to minimize heat transfer to the die – permits working metal at temperatures to 3500°F – yields longer die life.

DYNAPAK requires no separate pneumatic power source...DYNAPAK is easily installed, horizontally or vertically...DYNAPAK produces smooth surface finishes, radii to .003", webs to .010", fins to .010"; forges to near-zero draft angle. Evaluate DYNAPAK for your metal working problems. Write, wire or phone.

DYNAPAK

CONVAIR, A DIVISION OF GENERAL DYNAMICS CORPORATION

1243 Transit Avenue, Pomona, California · Phone NAtional 9-1109

Field Report . . .

and Ajax Engineering Divisions, and the present Magnethermic plant as the Magnethermic Division.

Lewyt SAGE Equipment Contracts Boosted to $26 Million

New add-on order from the Air Force to Lewyt Manufacturing Corp, Long Island City, NY, for production of Random Access Plan Position Indicators used in the Semi-Automatic Ground Environment System (SAGE), brings total contracts received for this equipment to $26 million. Equipment covered in the new order operates in conjunction with data processing systems being manufactured by Burroughs Corp.

Edlund Machinery Offers Gun Drilling Service

New contract manufacturing service for deep hole drilling operations on production run or small lot and experimental work is availabe from Edlund Machinery Co, Cortland, NY. Specially designed vertical gun drilling machines can produce, at production rates, smooth holes, accurate in both diameter and straightness with finishes of 4 to 10 mu-in. Holes can be drilled in all types of material, aluminum, cast iron, tool steel, bronze, stainless, and other steels.

Rocketdyne Division . . .

. . . of North American Aviation has a $4.3 million classified contract from Army Ordnance. Work will be done at the Canoga Park, Calif, plant.

(continued on page 214)

"You're a blundering idiot and I'd fire you this minute if you wasn't my boss!"

How to Install Machines

WITHOUT WRENCH, DRILL OR BOLTS

WITH Red Line UNISORB

Whether installing one machine or a whole plant, users report that Unisorb Pads make the job go "slick as a whistle." Here's why:

- Pads are cut to size, buttered with Unisorb Cement, spotted under legs and machine set immediately in place.
- Unisorb Cement has tremendous bonding power, will keep a machine safely in place even under severe side thrusts.
- No hole drilling, bolt alignment or pock-marked floors.

RESULTS . . .

- Installation costs and time are drastically reduced.
- Absorbs up to 85% of transmitted vibration. Cuts noise, reduces maintenance and improves working conditions.
- Machines can be quickly and easily moved at any time.

Ask about the complete line of Unisorb Mounting Pads with engineered density and thickness for every type machine. Send for special trial offer, NOW. Fast delivery, money back if not satisfied. Sold by leading Industrial Distributors or write direct.

Unisorb Level-Rite is a universal, self-contained leveling mount for all types of machinery. Send for bulletin.

UNISORB 200 SOUTH STREET BOSTON 11, MASS.

Division of The FELTERS Company

Want more information? Send for set of Unisorb "Facts" Books!

Please send me a Unisorb Sample and Free Book.

Company .....

Name .....

Address .....

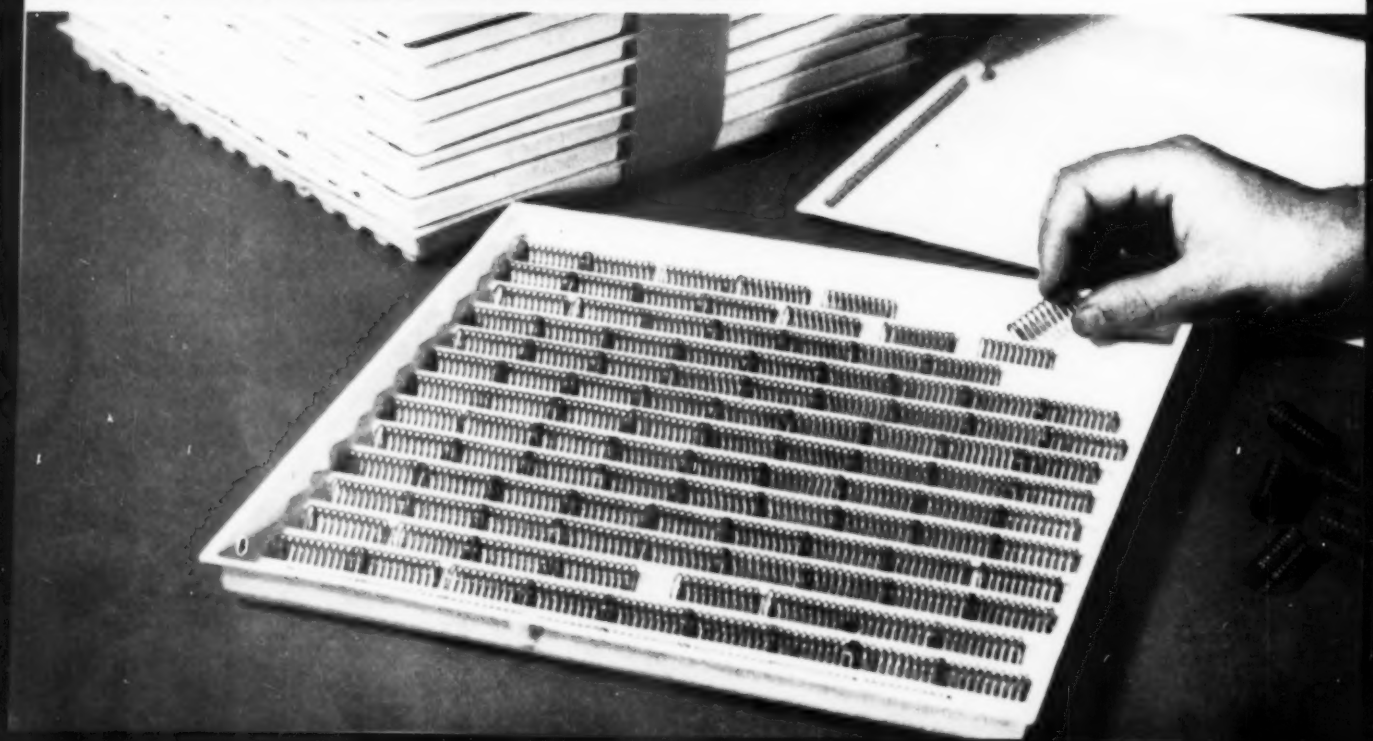
City ..... Zone ... State .....

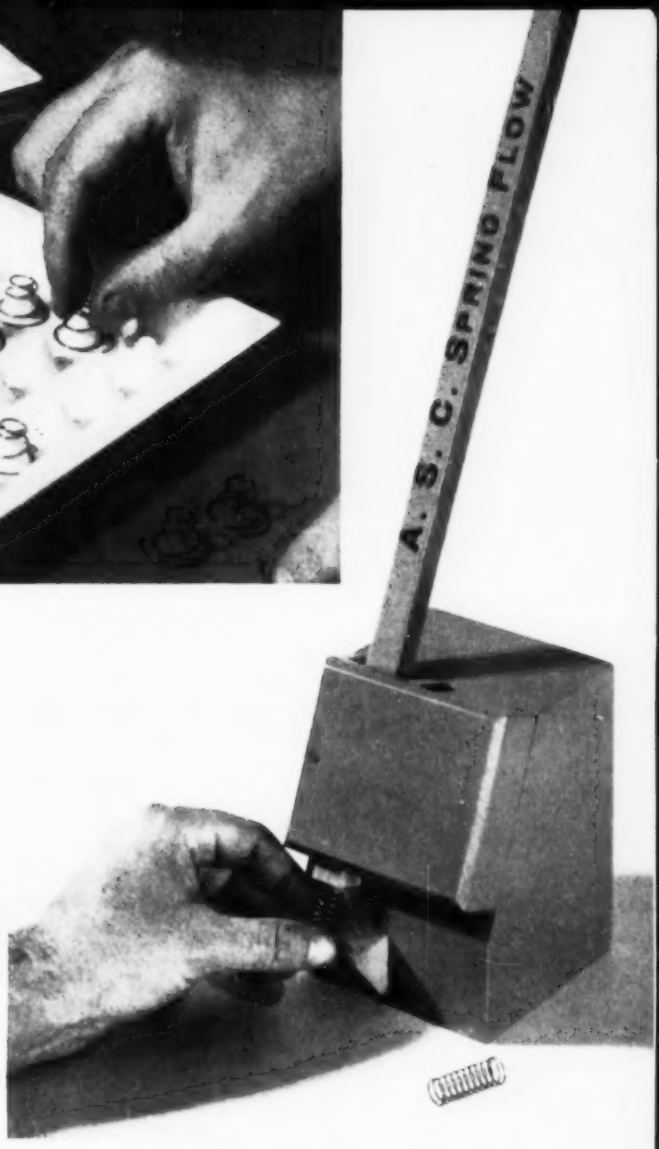
FE9-4

NEW... Spring Flow®

Custom-tailored packaging of springs that cuts costs and speeds operations in your plant

Spring Flow is a systematic approach to the problems of handling and storage of springs, wire forms, small stampings, in customer plants. It overcomes time-wasting tangling, and the distortion that often results from tangling. It can be engineered for specific applications to expedite hand or automatic assembly.





Spring Flow lowers handling and assembly costs — eliminates distortion — protects finish

Spring Flow makes use of a variety of modern materials, dispensers, containers. The extent to which it may be applied depends on the complexity of each individual part and handling requirements. The cost of Spring Flow is frequently offset by resulting savings.

The potential benefits of Spring Flow almost defy imagination. Ask for a Spring Flow proposal for your springs or other fabricated-metal products. Or find out more about this exclusive service by writing for the new booklet—"Spring Flow."

Associated Spring Corporation

General Offices: Bristol, Connecticut

Wallace Barnes Division, Bristol, Conn. and Syracuse, N. Y.
B-G-R Division, Plymouth and Ann Arbor, Mich.
Gibson Division, Chicago 14, Ill.
Milwaukee Division, Milwaukee, Wis.
Raymond Manufacturing Division, Corry, Penna.
Ohio Division, Dayton, Ohio
F. N. Manross and Sons Division, Bristol, Conn.
San Francisco Sales Office, Saratoga, Calif.
Seaboard Pacific Division, Gardena, Calif.
Cleveland Sales Office, Cleveland, Ohio
Dunbar Brothers Division, Bristol, Conn.
Wallace Barnes Steel Division, Bristol, Conn.

Canadian Subsidiary: Wallace Barnes Co., Ltd., Hamilton, Ont. and Montreal, Que. Puerto Rican Subsidiary: Associated Spring of Puerto Rico, Inc., Carolina, P.R.

CIRCLE 322 READER SERVICE CARD

earn a

$2,000 DIVIDEND
on PAYROLL DOLLARS/YEAR

with this **new** Impactool
in the hands of an operator

I-R's new ⅜" capacity Impactool has 40% more power than its predecessor. This new tool can help you achieve some quick cost reductions. If the tool operators in your plant are using older Impactools, you could increase their man-hour productivity by as much as $2000 Payroll Dollars per year for each operator, just by replacing the older tools with new I-R 804's.

Here's the way it works! Each of your tool operators probably earns about $5000 a year, but let's say he uses the tool 50% of his time. So $2500 of his annual wage is chalked up to tool operation. By boosting his productivity 40%, you are actually increasing his man-hour output by $1000 Payroll Dollars (40% x $2500). This dividend, or extra man-hour output, possible without adding to your present payroll, is your *Dividend on Payroll Dollars*. If you have 10 operators, that's a $10,000 Dividend.

The best way to fight today's higher production costs is to take the limitations off your man-hour output, and start earning your Dividend on Payroll Dollars.

The fastest, easiest way to do this is to call your Ingersoll-Rand Branch Office today! Or write Ingersoll-Rand, 11 Broadway, New York 4, N.Y.

Ingersoll-Rand

Tools plus AIRengineering increase output per man 8-909

Field Report . . .

Convair to Study Sub-Zero Coolants

AF contract has been awarded to Convair Division of General Dynamics to investigate the use of sub-zero coolants in machining. Covering survey, evaluation, and simulated production, project will include use of several coolants and combinations, and various basic materials which will be worked under different machining operations. Temperatures down to minus 150 F will be studied. Analyses will be made of the effects on machine operations and of the differences in time, efficiency, and quality in producing parts.

PRR to Build 11,500 New Cars

Pennsylvania Railroad directors have approved a program to build 11,500 new freight cars in its Altoona, Penna, shops. Company says the new cars represent the start of an extensive building program. In addition, Pennsy plans to continue its schedule of making heavy repairs on 25 cars a day of its present fleet of 172,000. Program means employment of additional workers at the shop which now has a workforce of 6000 following the recall of 600 during the last few weeks.

Northrop to Put Up $4 Million R&D Unit

Directors of Northrop have approved an expenditure of $4 million for a new engineering, research and development, and pilot production facility for its Nortronics Division, Beverly Hills, Calif. Astronertial and inertial guidance systems, naviga-

(continued on page 217)

"Thank you for the bonus money boss, and if I'm ever in Tibet I'll spend it."

TOOL NEWS

carbide

- *Slash Tool Costs*
- *Increase Output*
- *Eliminate Grinding*
- *Cut Tool Change Time*

WESSON Now Has 144 Standard Boring Bar Models

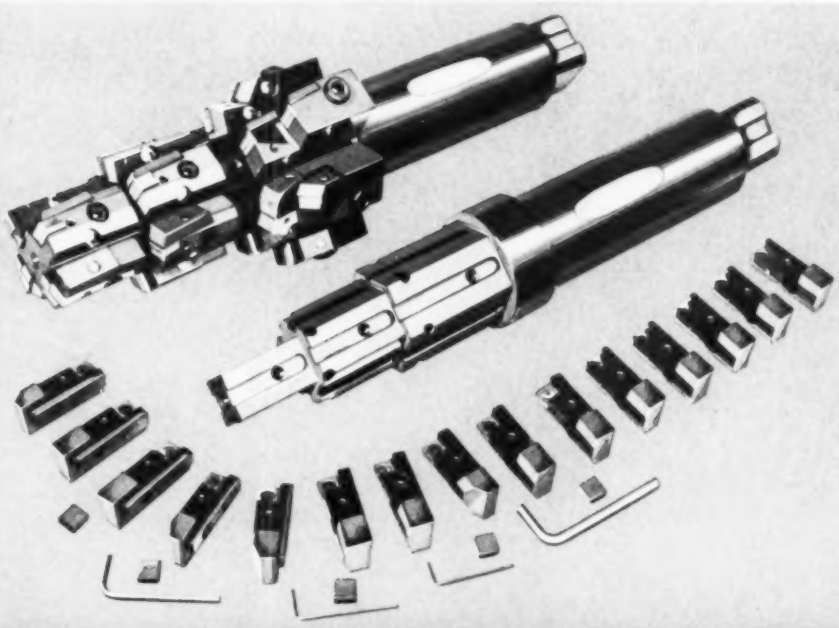
Rapidly growing demand for Wesson boring bars with throw-away carbide inserts has resulted in the standardizing of 144 models in four basic styles for quick delivery . . . and an end to your boring problems.

The new standard line includes 96 models that combine expendable inserts with precision adjustment for OD's. Bore diameters range from 1.50 to 2.60". Either square or triangular inserts can be adjusted outward for a total range of 0.100 to 0.200", depending on diameter. (Anvils and clamps for round inserts are available on request.) Right- and left-hand models are available for either deep-hole boring or shallow boring.

The Micro-Adjustable assembly is actuated by a screw with a head graduated in 0.001-inch divisions, guided by a keyway and held rigidly by a locking screw. High boring accuracy is assured with this quick, simple adjustment.

Where adjustability is not needed, there are 48 standard models in two basic designs for straight boring with a lead angle (square inserts), and for boring and facing (triangular inserts). These styles have either positive or negative rake angles.

Write for Bulletin MB-1158 for data on standard Micro-Adjustable and nonadjustable boring bars using throw-away carbide inserts.



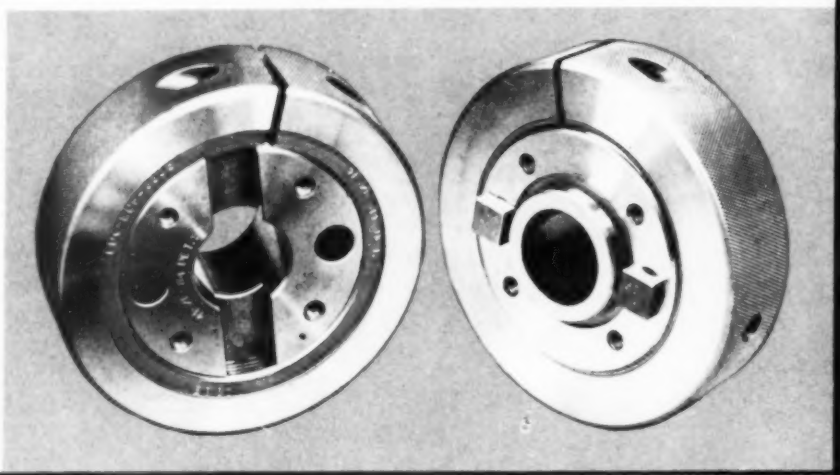
Combine Operations in One Tool

The adjustable throw-away insert principle can be adapted to a limitless variety of tools combining different operations. At left, is a complete tool —and all its components—for making 15 simultaneous cuts. Replaceable throw-away insert holders, ground to 0.001-inch tolerances and infinitely adjustable on both axial and radial dimensions, bore 3 steps, end face and chamfer automotive steering-gear housings at the Indianapolis plant of Chrysler Corp.

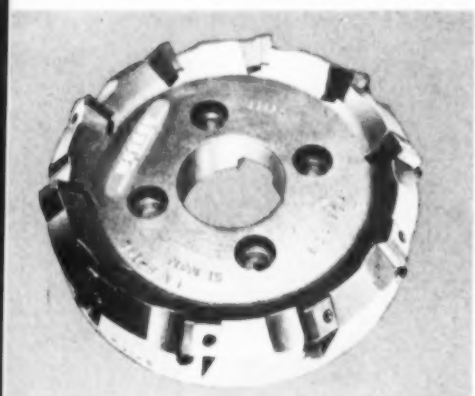
carbide **TOOL NEWS**

1 DO YOU GRIND FACE MILLS?
These adaptors will save you money

With the new Wesson Rigidcut micro-adaptors for milling cutters you can grind cutters an average of 4 times before re-setting the blades—also eliminates the need for costly adjustable milling cutter spindles. Permits presetting cutters on the bench. Total adjustment available is 0.125 in. Adaptors available for cutter diameters from 4½ to 12 in. Manufacturing precision is such that concentricity (indicated total runout) and squareness with face are held to within 0.0005 in. Ask for Bulletin 158.

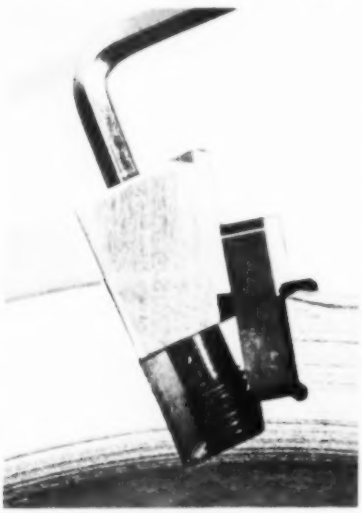


2 WANT TO STOP GRINDING FACE MILLS?
Throw-aways are the answer on many jobs

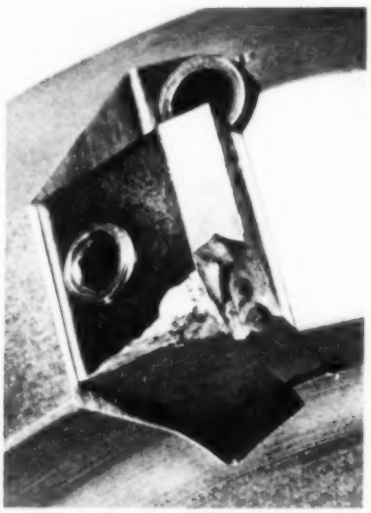


The cutter . . .

Reduce your cutter inventory. Rough or semi-finish cast iron or steel—*all with the same cutter body*. Just change the Wessonmetal throw-away inserts. Each insert has eight cutting edges. Inserts are backed by quickly replaceable low-cost hardened steel anvil-wedges designed to protect the cutter body against accidental damage. Cutters available in 4 lead angles—15, 30, 45 and 87 degrees. Ask for Bulletin #358-M.



How it locks . . .



How it protects . . .

tools **Wesson**
carbide **Wessonmetal**

WESSON COMPANY, DEPT. AD
1220 Woodward Heights Blvd., Detroit 20, Mich.
IN CANADA:
WESSON CUTTING TOOLS, LTD.
93 Judge Road, Toronto 18, Ontario

LITHO IN U.S.A.

tion and guidance computers, infra-red and optical systems and equipment, and electronic ground equipment will be created, designed and developed at the facility.

Canadair Gets Bomarc Parts Order

Canadair, Ltd, Montreal, a subsidiary of General Dynamics Corp. has an initial contract for $1.7 million to turn out wings and ailerons for the AF Bomarc, a long range anti-aircraft missile made by Boeing. Canadian decision to produce components for the missile will be a factor in the eventual installation of Bomarc bases in Canada.

Penn State Machinability Seminar

Seminar, to be conducted June 7 to 12, will cover fundamental theory of metal cutting; methods and techniques of research instrumentation for machinability tests; recent developments in the field, such as new tool materials, ceramic tools; machinability of high temperature resistant alloys; economics of machining; and practical application of machinability data. Additional information may be obtained by writing Extension Conference Center, Pennsylvania State University, University Park, Penna.

Ford to Spend $35 Million Plus At Dearborn Steel-Making Unit

Ford Motor Co plans to improve its steel-making facilities at Dearborn, Mich, include a 75,000-sq-ft building extension to be added to the cold

"Let's leave my yacht out of this discussion!"

Now

AUTOMATIC POSITIONING

with the

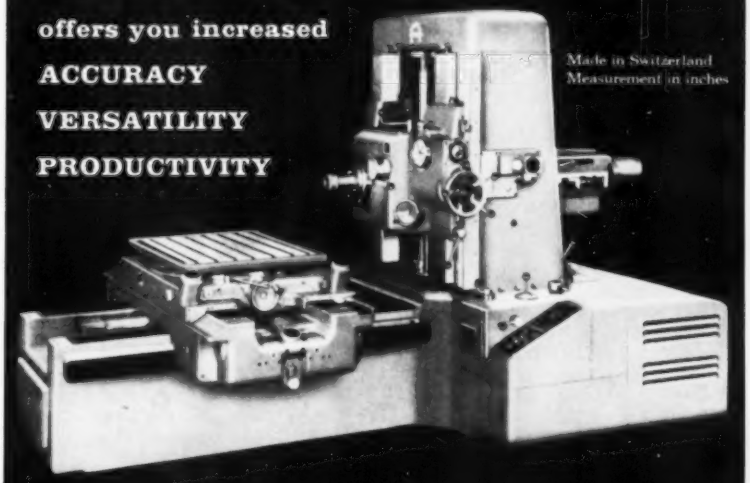
DIXI 75 horizontal optical jig borer

offers you increased

ACCURACY

VERSATILITY

PRODUCTIVITY



- Automatic positioning can be changed instantly to manual operation
- Projected optical setting — direct reading to .00005" for linear motions and 1 sec. of arc for built-in rotary table. Linear optics provided with adjustable zero reference
- Simplified controls functionally arranged for greater operating speed and efficiency
- 3" diameter boring spindle
- Increased capacity: table size 39⅜" x 32"; 29⅝" cross travel; 23⅝" longitudinal travel; 25⅝" vertical travel
- Hydraulic feeds and infinitely variable spindle speeds
- Rear support optional

MBI has engineers available for consultation, guarantees service by factory trained staff, and stocks spare parts in New York.—Join the long list of leading aircraft and manufacturing plants throughout the United States which are using the horizontal optical jig borer.

Demonstrations upon request at our conveniently located demonstration centers.

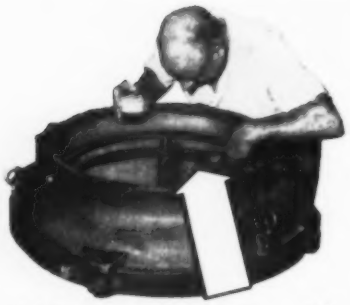
MBI

M. B. I. EXPORT & IMPORT LTD.

A DIVISION OF MACHINERY BUILDERS, INC.

475 Grand Concourse, Bronx 51, N. Y.

"Over 25 years' experience in designing and building machinery."



Plastic Steel® saved over $1000... plus days of downtime for MARRINER

A broken centrifuge at Marriner Combing Company stopped production on an important order. PLASTIC STEEL was used for on-the-spot repairs and the machine was back in operation within an hour at a cost of less than $5.00. Using conventional repair methods would involve several days and cost over $1000.

Hundreds of companies have saved time and money by repairing worn machine parts, cracked castings, leaking hydraulic systems and tanks, rebuilding worn pumps or valves, etc., with PLASTIC STEEL®.

PLASTIC STEEL® and other Devcon products are used for making jigs, fixtures, metal-forming dies, plastic and rubber molds, foundry patterns and core boxes, and other industrial tools.

PLASTIC STEEL® — as easy to use as modeling clay — hardens to steel-like strength in 2 hours . . . can be machined with regular tools. Bonds all metals, wood, glass, concrete, etc. to itself or each other. Extremely high tensile, compression, impact strength — excellent chemical resistance.

Find out how PLASTIC STEEL® and other Devcon products can save time, cut maintenance costs and speed production in your plant — write for FREE bulletin today.

Distributed nationally by leading industrial suppliers

DEVCON CORPORATION

17 ENDICOTT STREET, DANVERS, MASS.

Field Report . . .

rolling mill. There'll also be new facilities and operational changes in all the processes. Ford's 1959 ingot capacity is listed at 1.9 million tons a year. Company recently has been producing about 50% of its own requirements. Modernization program or no, Ford reports that it will continue to rely on independent suppliers for the other half of its steel needs.

King Graphite Products . . .

. . . a new corporation which is producing graphite lubricating products has started operations in Trenton, Mich. Its new lubrication fortifier, KGP, a synthetic colloidal graphite of particle size permanently suspended in a neutral oil carrier for use in conjunction with lubricants, reportedly provides lubrication in temperatures as high as 725 F.

Merger of Longren Aircraft . . .

. . . Torrance, Calif, into Aeronca Manufacturing Corp, Middletown, Ohio, has been approved by shareholders of both companies. Sales of Longren for its last fiscal year were $5.8 million; Aeronca's sales for 1958 were approximately $23 million.

American Viscose and Sun Oil Set Up an Affiliate

An equally owned affiliate, AviSun Corp, scheduled to be the nation's second (only producer now is the Parlin, NJ, plant of Hercules Powder Co) commercial supplier of polypro-

"Compliments of engineering—and there are a few changes on this job . . ."

KEEP FLOORS SAFE AND CLEAN WITH EASE AND ECONOMY

FLORCO®

Florco is the most effective, practical and economical adsorbent for the maintenance of dry, safe, non-slip floors, decks and all porous surfaces.

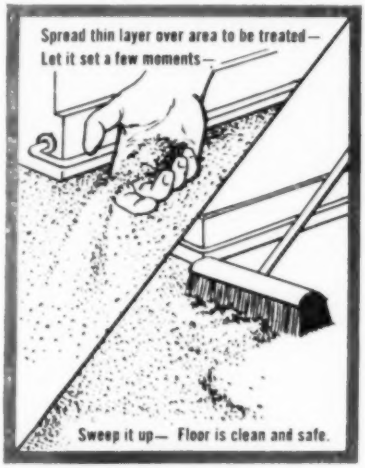
Florco combines high adsorption capacity with physical strength; it is one of the few materials of its type to meet Armed Forces specifications and be approved by the Underwriters' Laboratories, Inc.

Florco's unique adsorptive properties prevent "bleeding" of adsorbed liquids and materials to cleaned surfaces.

Florco contains less "micro-dust" than any other similar material.

Florco is safe to use on all types of surfaces, creates no health hazard, is non-flammable, provides a rough non-skid surface upon which it is safe to walk and work.

Florco usage does not require special costly applicators or removal equipment.



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for free demonstration sample and descriptive pamphlet on Florco. Just enclose this ad with your signed business letterhead.

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ADSORBENTS
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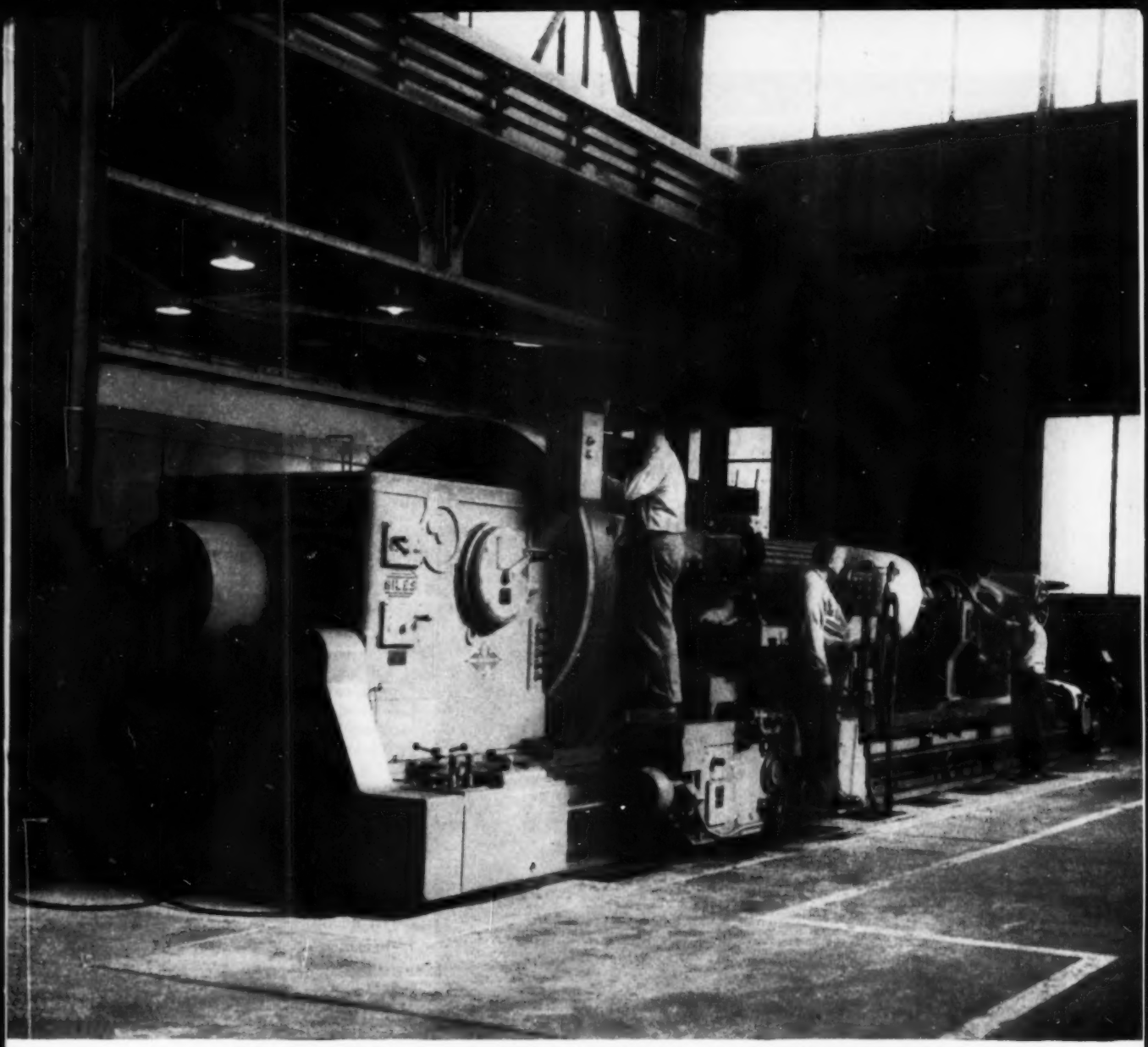
TALLAHASSEE, FLORIDA



This new 72 in. x 38 ft. Niles Lathe recently installed at the Consolidated Edison Co. of New York repair shop at Astoria can handle all the rotary fields and three-fourths of the high-speed turbine spindles in the company's network of generating plants.

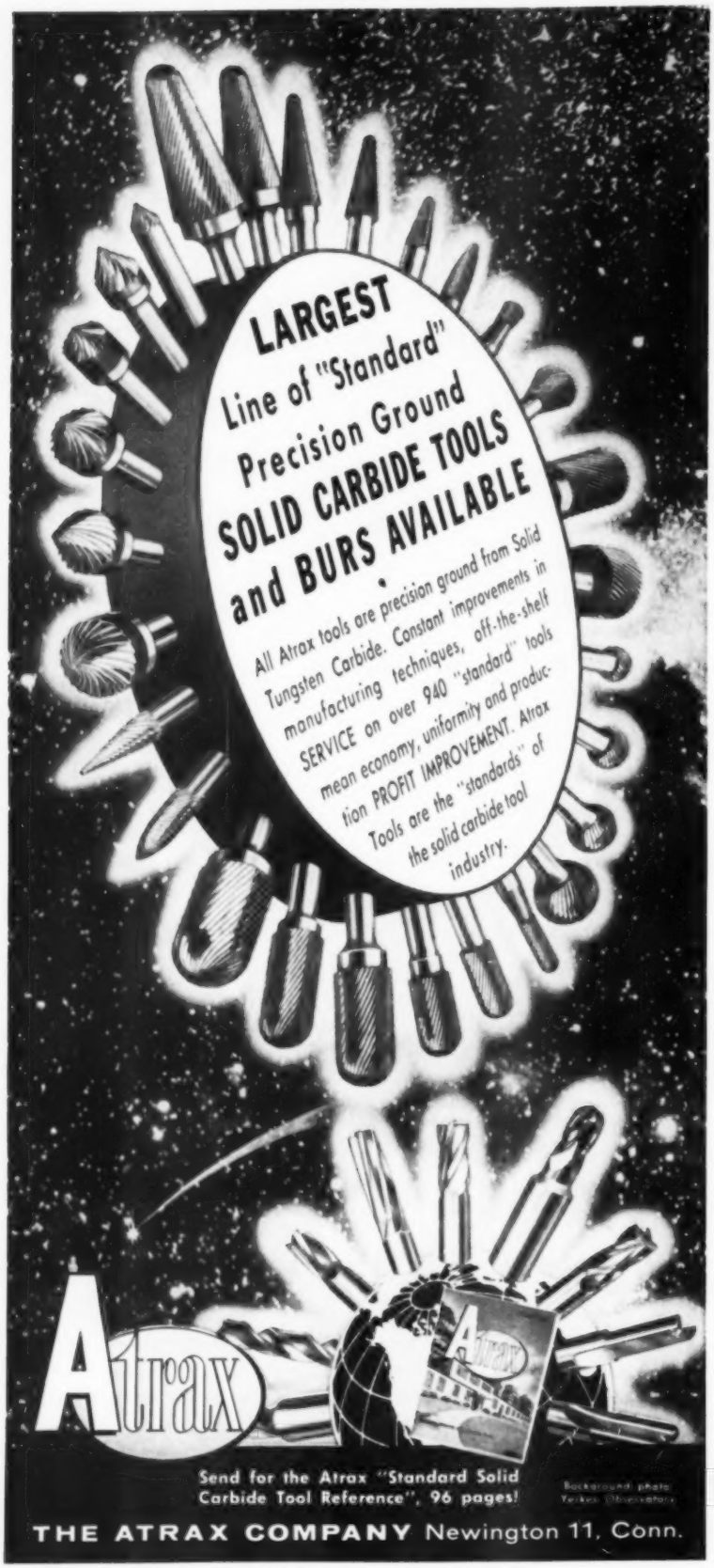
In machine shops the world over Niles and Hamilton Tools save thousands yearly

For more than 130 years, the Hamilton Division of the Baldwin-Lima-Hamilton Corporation has been designing and building the world's finest machine tools. From routine day-to-day rebuilding and repairing of old tools to the design and manufacture of one of the world's largest boring mills (43 ft.) for shipment to Italy, Hamilton serves industry worldwide. And as every railroader knows, Niles represents the world's most complete line of railroad wheel and axle maintenance tools. In industrial machine shops around the globe, Niles and Hamilton tools save thousands of dollars a year.

Hamilton Division Hamilton, Ohio

BALDWIN · LIMA · HAMILTON

Diesel engines • Mechanical and hydraulic presses • Can making machinery • Machine tools & genera machinery


LARGEST
Line of "Standard"
Precision Ground
SOLID CARBIDE TOOLS
and BURS AVAILABLE
All Atrax tools are precision ground from Solid Tungsten Carbide. Constant improvements in manufacturing techniques, off-the-shelf SERVICE on over 940 "standard" tools mean economy, uniformity and production PROFIT IMPROVEMENT. Atrax Tools are the "standards" of the solid carbide tool industry.
Atrax
Send for the Atrax "Standard Solid Carbide Tool Reference", 96 pages!
Background photo Yerkes Observatory
THE ATRAX COMPANY Newington 11, Conn.

Field Report . . .

pylene, has been set up by American Viscose Corp and Sun Oil Co. Sun developed the process for making polypropylene resins and AV the processes for producing polypropylene film and fibers. Material is a very light plastic reported to possess exceptional toughness and structural strength. Commercial quantities of the resin are expected to be available by mid-summer from facilities leased at the Port Reading, NY, plant of Koppers Co. Facility's capacity is estimated at 20 million lbs a year.

Talon Buys Die Casting Company

Talon Inc, Meadville, Penna, has purchased the assets of Paramount Die Casting Co, St Joseph, Mich, will operate it as a subsidiary. Paramount produces custom die castings in aluminum, magnesium, and zinc.

Edsel Sales in LA Area . . .

. . . during the first 40 days of this year showed an increase of 17% over the last 40 days of '58. And there was a sales increase of 34% during the second 10-day period of February over the first 10 days of the month. Nationally, too, Edsels were moving at a 10% higher rate than the first half of February a year ago.

Federal-Mogul Automating Service Distribution Center

New construction will add 43% more space to the plant in Coldwater, Mich, which distributes F-M engine bearings, BCA ball bearings, Bower roller bearings, and National oil seals to jobbers and bearing specialists through a network of F-M service

"It's days like this when I feel I've really accomplished something!"

NEW! "Feather-touch" PUSH-to-TEST PILOT LIGHT

Added to Square D Oil-Tight Pushbutton Line

Completely oil-tight, even when depressed

Pressure connections eliminate internal wires

Positive contact "feel" in test position

No additional panel space required

Choice of 6 color caps

Full range of voltage ratings

Mounts interchangeably with oil-tight pushbuttons and selector switches

OIL-TIGHT OPERATORS

Standard Button

Mushroom Button

Selector Switch

Coin-Operated Selector Switch

Key-Operated Selector Switch

Selector Pushbutton

Stop Button Lockout

Start Button Lockout

Maintained Contact Attachment

Selector Switch and Pushbutton Lockout

NEW!

4-Position Joystick Operator

Wobble Stick Operator

Neoprene Cap

Here's why Square D Pushbuttons are preferred —by those who *build* machines—and by those who *buy* them!

Easy to use • Operators require only a single mounting hole for quicker installation. Pressure wire connectors mean simplified wiring.

Longer lasting • All-metal operator construction, anodized aluminum buttons, mean greater mechanical life. Melamine contact blocks with double-break silver contacts assure longer electrical life.

Wide flexibility • Any operator can be used with any contact block to meet all your requirements.

Small size • Only a minimum of panel and back-of-panel space is required.

Variety of contacts • Contact block arrangements include single-pole double-circuit, duplex double-circuit, tandem duplex, three-position duplex, and overlapping contacts.

• • •

FOR COMPLETE INFORMATION on oil-tight pushbuttons, send for Bulletin 9001-T to Square D Company, 4041 North Richards Street, Milwaukee 12, Wisconsin.

EC&M HEAVY INDUSTRY ELECTRICAL EQUIPMENT...NOW A PART OF THE SQUARE D LINE

SQUARE D COMPANY

let Ingersoll HYDROSPIN your parts

If the shape of your part is tubular, conical, hemispherical, or curvilinear, hydrospinning by the Ingersoll Kalamazoo Division may save you costly machining expense and time. If you want a seamless part, try hydrospinning. If you want precise wall thickness, turn to hydrospinning. Hydrospinning saves on metal, time and labor.

COMPLETE PRODUCTION FACILITIES

Ingersoll Kalamazoo Division has an experienced engineering staff, and complete hydrospinning equipment. If you have a metal forming problem where hydrospinning may be of help to you, send an outline of your problem or contact the Defense Sales Dept. of

Borg-Warner Corporation

ENGINEERING B-W PRODUCTION
INGERSOLL KALAMAZOO DIVISION
1810 N. Pitcher St. • Kalamazoo, Michigan

Field Report . . .

branches. Major office space is reserved for a giant electronic computer that'll take over order processing and inventory control next October. Eventually, the entire center will be automated.

Consolidated Electrodynamics . . .

. . . Systems Division, Pasadena, has received contracts totaling $3.1 million from Convair Astronautics for production of ground-support equipment for the Atlas missile program. New orders bring Convair contracts with the Division to more than $5.5 million during the past six months for this equipment.

Superweld Corp . . .

. . . North Hollywood metal treating firm, has acquired all outstanding stock of Western Carbide Corp, a producer of a line of hard-facing alloys.

Heat Treating Facility Opens in North Carolina

Industrial Metal Treating Corp has opened in Charlotte. Services include carbon restoration, carbo-nitriding, carburizing, bright hardening of stainless steel, liquid honing, induction hardening, tool and die hardening, annealing, and stress relieving.

Sikorsky Gets $1.3 Million Order

Contract for modification of H-34 helicopters has been awarded to Sikorsky Aircraft Division of United Aircraft Corp. Retrofit modification will include installation of Sikor-

"I've been afraid of this—the deductions have caught up with my pay."

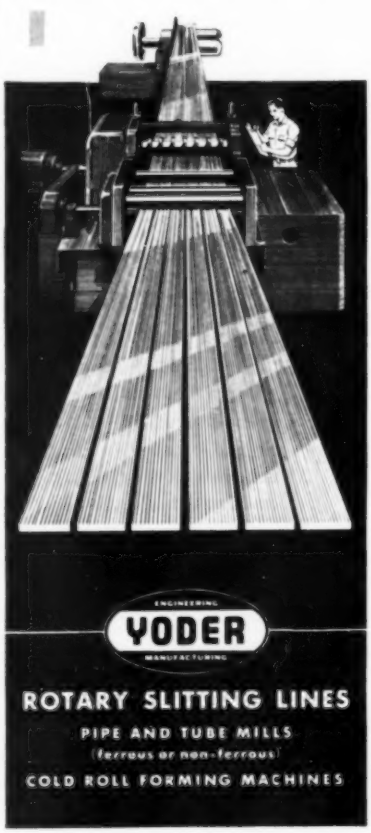
YODER

Rotary Slitters

Product dependability—integrity of manufacture—engineering for specific production needs have all contributed to establish Yoder equipment as the industry standard of excellence. Since 1909 Yoder-built machinery, including Pipe and Tube Mills, Roll Forming Equipment and Rotary Slitters, have earned world-wide customer satisfaction and recognition.

Profit from Yoder's years of engineering and service experience. Send today for the illustrated Yoder Slitter Book.

THE YODER COMPANY
5519 Walworth Ave., Cleveland 2, Ohio



ROTARY SLITTING LINES
PIPE AND TUBE MILLS
(ferrous or non-ferrous)
COLD ROLL FORMING MACHINES

A 3M Case History Report

STEEL POLISHING SPEEDED 10–15% WITH "PG" WHEELS

MANUFACTURER: Heintz Division of Kelsey-Hayes Co.
ADDRESS: Philadelphia, Pennsylvania.
PRODUCT MANUFACTURED: Automotive Metal Stampings.
3M ABRASIVE USED: "PG" Wheels.

HOW 3M ABRASIVES ARE USED: Finishing operation. Remove die marks, scratches, and other forming defects from cold-rolled carbon steel auto grille bars, prior to plating.

OPERATIONAL DATA ON 3M METHOD: Grit 220 Resin Bond Cloth "PG" Wheel on double-spindle floor lathe with buff-wheel.

OPERATIONAL DATA ON PREVIOUS METHOD: 2-station, 3-step method. 1st, #120 disc; 2nd, set-up wheel; 3rd, buff-wheel.

PROVEN ADVANTAGES OF 3M METHOD: Former 3-step operation reduced to 2 steps; "PG" Wheel and Buff. "PG" Wheel leaves no scratches on work piece; speeds production 10-15%.

OTHER 3M ABRASIVE PRODUCTS IN USE: "Three-M-ite" Resin Bond Cloth Portable "PG" Wheels on hand-grinders are used to remove in-use scratches, other imperfections from dies, without removing them from press. "PG" Wheels replaced hand methods, reduced repair time from 14 hours to 30 minutes.

WANT MORE INFORMATION? Send for free manual, "Modern Metal Finishing with 3M 'PG' Wheels." Write to 3M Co., St. Paul 6, Minn., Dept. AK-39.

"PG" Wheels are manufactured in U.S.A. by 3M Company, St. Paul 6, Minn. Export: 99 Park Avenue, New York. Canada: London, Ontario

WE RECOMMEND
How to use coated abrasives to cut costs, improve production, shown in the new 426 page book
COATED ABRASIVES
MODERN TOOL OF INDUSTRY
At bookstores or McGraw-Hill N. Y.

3M Coated Abrasives

"PG" WHEELS

MINNESOTA MINING AND MANUFACTURING COMPANY
...WHERE RESEARCH IS THE KEY TO TOMORROW

3M COMPANY

PRODUCTION SWINGS UP

when you use ELGIN tools

Elgin Golden Circle Solid Carbide Rotary Tools have smooth, sharp, hard cutting edges that bite into the work and turn out more pieces per hour. They're real production tools! Made of solid carbide, they stay sharp longer than ordinary tools, insure longer runs, keep costs down. Write for catalog, or call your Elgin Stocking Distributor.

Inquiries invited from progressive distributors

Abrasives Division

ELGIN NATIONAL WATCH COMPANY

Elgin, Illinois

Field Report . . .

sky's automatic stabilization equipment. Work will be done at the company's overhaul and repair department at Bridgeport (Conn) Municipal Airport.

Infilco Inc Expands

The Tucson, Ariz, company has acquired Gale Separator Co, Bloomfield, NJ. Activities of Gale in the manufacture of interceptor and separator systems will be continued and merged with Infilco operations in its Coolant and Cutting Oil Cleaning Division.

Super Tool Ups Prices

Price increases ranging up to 10% on solid cemented carbide drills, reamers, and end mills ¼ in. in diameter and larger have been put into effect by Super Tool Co, a division of Van Norman Industries, Detroit. Price hike, in line with the recent increase established by major carbide metal producers, does not apply to carbide-tipped tools.

Avtronics, Inc . . .

. . . has been formed in Los Angeles. Firm will specialize in marketing of components and systems for missiles, satellites, and other space vehicles. President is R B Hutton, former VP, sales for Leach Corp.

Allis-Chalmers Has Formed . . .

. . . a Nuclear Power Dept within the recently renamed Atomic Energy Division. The department will be responsible for the Division's activities in the nuclear fission field.

"I don't sleep well; I keep turning in my sleep."

CIRCLE 335 READER SERVICE CARD

CIRCLE 336 READER SERVICE CARD

5,790 IN-STOCK Drill Types and Sizes

GIVE YOU UNEQUALLED DESIGN AND SIZE SELECTION

For Any Material . . . Any Application

Continuous Production . . .

Is assured when you specify **W & B** because Whitman & Barnes carries more inventories to meet your production needs.

Application Tested . . .

For proved quality performance! You get longer tool life . . . less down-time . . . lower costs!

Fast Service . . .

Is yours from a **W & B** distributor. He maintains complete stocks to give you drop-of-the-hat deliveries.

Your Whitman & Barnes distributor can furnish you with complete product information and free literature. Call him today!

WHITMAN & BARNES

MAKERS OF FINE TOOLS SINCE 1848

DRILLS AND REAMERS

40035 PLYMOUTH ROAD • PLYMOUTH, MICHIGAN

NEW YORK CHICAGO LOS ANGELES

The two drills shown illustrate the range of standard drill sizes and types available from W & B inventories.

'FLIP TOP' four-Slide

number OO

automatic four-slide

NEW TOOLING ACCESSIBILITY ..... Back—front; top—bottom
NEW INCREASED FEED LENGTH ..... Positive, accurate, up to 4¼"
NEW COMPACT DESIGN ..... Less than 2½' x 2½' floor space

While basic design and equipment of this machine have been PROVED in millions of production hours, these important NEW features save time in tooling and maintenance, reduce down-time and increase capacity.

Ample tooling spaces at all positions and extra long feed present new opportunities for economical production of parts now being made by more costly methods. Baird's pioneering experience in this field can help you. Send us parts or prints for production analysis. Write Dept. AM

THE BAIRD MACHINE COMPANY
STRATFORD • CONNECTICUT

BAIRD

BAIR

Free Literature

To order any of these bulletins, circle corresponding number inside back cover.

MACHINES AND ATTACHMENTS

1 NUMERICALLY CONTROLLED CONTOUR MILLING MACHINES—*Giddings & Lewis Machine Tool Co, Fond du Lac, Wis.* 16-page catalog GLH-700 gives details on horizontal DiMil machines with Numeripath continuous-path tape control for completely automatic die sinking and other contour milling work. Four table-type models, the smallest with a 30 x 48-in. working surface, handle the majority of all die work. Floor-type models are available to produce dies up to the largest in use. Operational details; simplified programming techniques; design features illustrated; basic machine specifications included.

2 FLAME SHAPE CUTTING MACHINE—*National Cylinder Gas Division, Chemetron Corp, 840 N Michigan Ave, Chicago 11, Ill.* Booklet N-102 describes Type R designed for swift, accurate, economical cutting of steel shapes of practically any contour, size, or thickness. Shapes can be welded to make complete products or sections which can be joined to castings or forgings. Typical installations illustrated and described. Includes section on new NCG electronic line tracer, a control in which the tracing head automatically follows a pencil or ink drawing of the part to be cut, eliminating need for templets.

3 TAPE CONTROLLED TURRET DRILLING, TAPPING, AND BORING MACHINE—*Burg Tool Manufacturing Co, 15001 S Figueroa St, Gardena, Calif.* 8-page bulletin pictures and describes Burgmaster unit that incorporates automatic numerically controlled positioning table with modified GE tape control unit. Six-spindle Model 2BHT has ¾-in. capacity, 8-spindle Model 3BHT has 1½ in. Information given on programming a part, preparing the tape, and operating the machine.

4 ELECTRIC CLUTCH HAND TURRET LATHE—*Pratt & Whitney Co, West Hartford, Conn.* 12-page catalog contains information on the Wade Model 94, specifically designed for secondary and repetitive operation work where ease of operation is a factor. Swing over bed is 9 in., distance between centers, 15 in. Design features illustrated and discussed.

5 HYDRAULIC PRESSES—*K R Wilson, Inc, Arcade, NY.* 12-page bulletin 95-D covers modernized, expanded line

(continued on page 229)

"Is that sand glass another of your sarcastic innuendoes about antiquated equipment around here?"

BARS IN THE LIFE OF A P.A.

HOW WOULD YOU LIKE TO WIN $100?

Write us your estimate of the number of tons of cold finished carbon steel bars in stock at steel service centers on January 1, 1959. If you are closest to the estimate being developed by the American Steel Warehouse Association*, the $100 is yours. Don't be conservative because the tonnage is always big—an excellent reason why your steel service center can give you terrific service when you need cold finished steel bars. All entries post marked on or before midnight May 17, 1959 will be considered. Please mail your estimate to "Contest," Bliss & Laughlin, Inc., Harvey, Illinois.

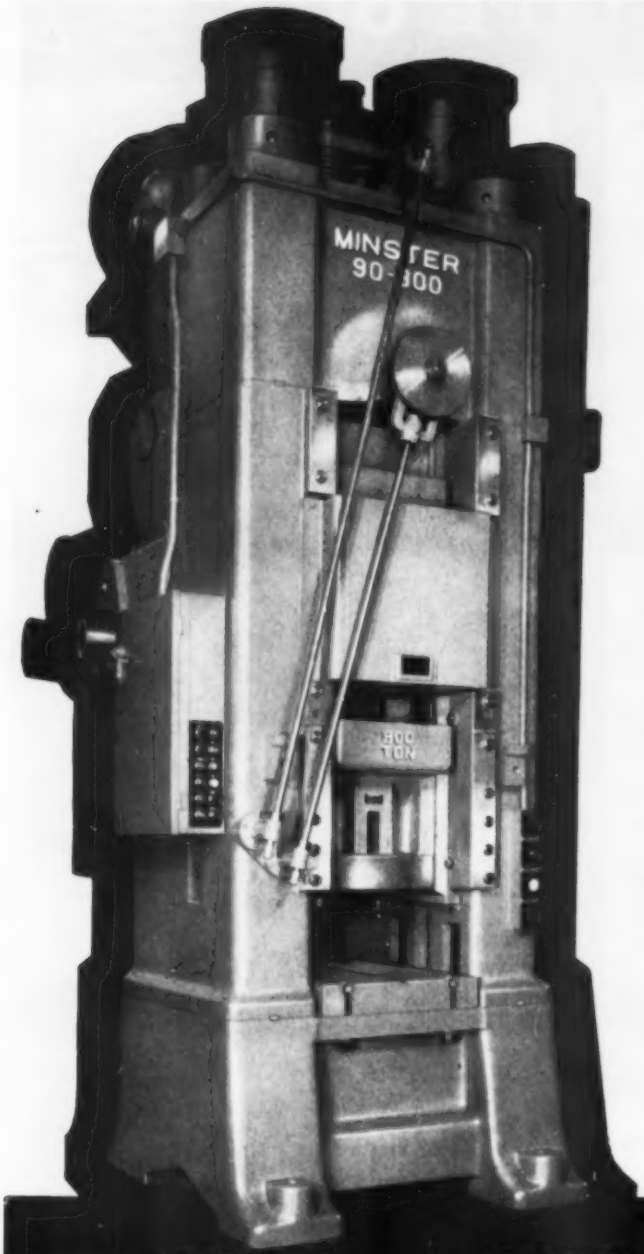
*Based on projections made from A.I.S.I. 16 Report.

Originators of LUSTERIZED® Finish—The BIG DIFFERENCE in Cold Drawn Steel Bars

BLISS & LAUGHLIN

GENERAL OFFICES: Harvey, Ill. • PLANTS: Harvey, Detroit, Buffalo, Mansfield, Mass.

Largest Independent Producer of Cold Finished Steel Bars

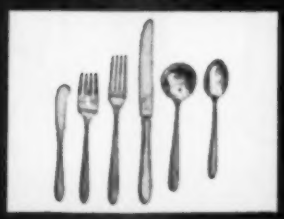


These Outstanding Features Make MINSTER KNUCKLE JOINT PRESSES More Productive

- The Precision Built into the Press Gives You Greater Parts Accuracy—Longer Press Life
- More Single Stroke Operations per Minute
- Higher Speeds for Greater Velocity of Impact
- Positive Continuous Lubrication Provides Greater Precision, Reduced Wear, Less Maintenance
- Massive Frame and Tie-Rod Construction Withstands the Tremendous Forces of Knuckle Joint Press Work

SIZING

COINING



EMBOSSING

THE MINSTER MACHINE COMPANY

MINSTER, OHIO

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of KRW four-column, single-action units. Specifications given for 48 models (either up-acting or down-acting) ranging in capacities from 25 to 1000 tons.

6 DOUBLE HORIZONTAL SPINDLE DISK GRINDER—*Besly-Welles Corp, South Beloit, Ill.* 8-page illustrated bulletin DH4 describes features of Model DH4, including pushbutton operation, accuracy to tenths, simple 3-step abrasive change, automatic dressing and sizing, centralized one-shot lubrication, and an improved coolant system. Machine will grind steel and cast iron and their alloys, non-ferrous metals, carbides, ceramics, and plastics.

7 CONTOUR SAWING MACHINE—*DoAll Co, Des Plaines, Ill.* 26-page brochure presents detailed information on the Pan-Arm with articulated cutting head. Feeding the cutting head while work remains stationary removes job size limitations and gives operator great freedom of control. Straight line cuts up to 17 ft long, and intricate contour cuts are quickly set up. Applications illustrated include fabrication of large machinery and marine parts by cutting them from the solid, and machining of the openings in thick extrusion dies.

8 INTERNAL GEAR FINISHER—*Michigan Tool Co, 7171 E McNichols Rd, Detroit 12, Mich.* Illustrated literature describes new design features of Model 870-C for either conventional transverse or plunge shaving of internal gears. Complete specifications included; data provided on an optional air-operated chucking adapter that increases production speed. Gears from a max 12 in. OD to a min 4 in. PD can be handled.

9 INDUSTRIAL AUTOMATION EQUIPMENT—*Radio Corp of America, Industrial and Automation Div, 12605 Arnold Ave, Detroit 39, Mich.* Product information folder contains descriptions and specifications of a wide variety of building-block automation machines for mechanizing and integrating production and assembly operations. Includes floor feeders and orientors, rotary hoppers, self-compensating grinder controls, high-speed automatic hardness testers and electronic inspection systems for multiple dimension gaging and selective segregation of parts.

TOOLS AND ACCESSORIES

10 JIG & FIXTURE COMPONENTS—*Jergens Tool Specialty Co, 712 E 163rd St, Cleveland 10, Ohio.* 84-page general catalog 201 gives specifications and illustrated data on 2000 standards including

"Beat it, Hogan. You've had enough overtime."

ANNOUNCING

Bunting®

Alcoa Aluminum Bars

BUNTING BEARING ALUMINUM is the newest metal offered in bar form as a thoroughly good bearing material. Available in 138 sizes of 13″ tubular and solid bars, Bunting Bearing Aluminum Bars are in stock now on shelves of Bunting distributors all over America.

If you are using a low priced bronze bar, this new Bunting Aluminum Bar will meet your need for high quality at low cost. Thus the high quality Bunting Precision Cast Bronze Bar is augmented by the high quality Bunting Aluminum Bar, providing dependable bearing materials covering the entire range of requirements.

Ask your local Bunting distributor or write for catalog and literature.

Other Products Available from your Bunting Distributor

866 stock sizes of Bunting Cast Bronze Bearings and 267 sizes of Bunting Cast Bronze 13″ Bars. 667 sizes of Bunting Sintered Oil Filled Bronze Plain, Flange and Thrust Bearings and 84 sizes of Sintered Bronze 6½″ Bars. Ask for Catalog 58.

343 sizes of Bunting Cast Bronze Electric Motor Bearings for all motors. Ask for Catalog 258.

Bunting®

BEARINGS, BUSHINGS AND SPECIAL PARTS OF CAST BRONZE OR SINTERED METALS. ALCOA® ALUMINUM BARS.

THE BUNTING BRASS AND BRONZE COMPANY, TOLEDO 1, OHIO

BRANCHES IN PRINCIPAL CITIES

ASK HIM

Your Bunting distributor is listed in the classified section of your telephone directory usually under Bars — Bronze and Bearings — Bronze.

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MICRO MILLING CUTS PRODUCTION TIME 31½ HOURS ... INCREASES TOOL LIFE 300%

SUPER-SPEED POWER QUILL

Sizing an aluminum cavity to .001" tolerance on a die for a rotary process machine at R. P. Scherer Ltd., Windsor, Ontario, was a simple operation for a PRECISE Super 80 POWER QUILL. This Super-Speed POWER QUILL —mounted on a standard machine tool—not only held the prescribed tolerance but cut production time 31⅓ hours and increased tool life 300% over previous machining methods.

PRECISE Super-Speed POWER QUILLS meet every production and toolroom requirement and are quickly mounted with PRECISE mounts on standard and special machine tools. They mill or grind the hardest alloy steel, soft plastic, wood and rubber, aluminum, Masonite and even glass. Their superhigh speeds, high torque, spindle and chuck rigidity permit the use of the hardest cutting tools for faster stock removal, improved surface finishes, maximum tool life, and the maintenance of tolerances to .0001". Adjustable spindle speeds range from 15000 rpm to 45000 rpm with power ratings up to 1½ hp from ordinary 110v or 220v power supplies.

Mail coupon below for complete information on the entire line of PRECISE Super-Speed MICRO TOOLS.

PRECISE PRODUCTS CORPORATION, Racine, Wisconsin, U. S. A.
Branch Plant: Precise, G. m. b. H., Duesseldorf, Germany

Quality and Precision Since 1882

Precise

Power Quills · Grinder Millers · Milling Machines · Accessories
Rotary Cutting Tools · Vapor-Lub Cooling Systems

PRECISE PRODUCTS CORPORATION, 3756 Blue River Road, Racine, Wisconsin
☐ Send complete information on Precise Tools. ☐ Have salesman call.
Also send data on Precise ☐ Cutting Tools, ☐ Vapor-Lub Cooling.

Name _____ Title _____

Company _____

Address _____

City _____ Zone ____ State _____

Free Literature

To order any of these bulletins, circle corresponding number inside back cover.

extensive line of workholding equipment, chuck jaw blanks, handles, wheels, strap clamp assemblies, knobs, forged items, plus engineering drawings with tracing templets available.

11 OPTICAL PRODUCTS—*Bausch & Lomb Optical Co, 635 St Paul St, Rochester 2, NY.* 24-page illustrated index (catalog L-86) lists current catalogs available. It is divided into consumer, ophthalmic, and scientific and technical products classifications. Each catalog entry is briefly described with factual account of contents and catalog number.

12 BEARING LUBRICATION MANUAL—*Miniature Precision Bearings, Inc, Precision Park, Keene, NH.* 25-page manual deals with lubrication of miniature instrument bearings. Covers oil and grease lubrication, properties of lubricating oils and greases, military specifications, standards, and special lubricants. Blending charts, nomographs, and other data included.

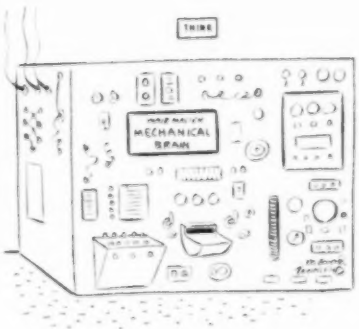
13 AIR - OPERATED DIAPHRAGM CHUCKS—*Erickson Tool Co, 35350 Solon Rd, Solon, Ohio.* 4-page bulletin, illustrated with photos, sectional views, and dimensional drawings, gives detailed information and full specification data on the three basic models comprising the line.

14 BORING BLOCKS WITH THROW-AWAY INSERTS—*Giddings & Lewis Machine Tool Co, Davis Boring Tool Div, Fond du Lac, Wis.* 4-page bulletin DB-410-A illustrates and describes block-type boring tools with square precision-ground throwaway carbide inserts, designed for use with standard Davis boring bars. Contains specifications and price data on two-cutter blocks for rough boring, and single-cutter micrometer-adjustable blocks for semifinish and finish boring. Carbide grade recommendations for boring various materials is included.

15 CARBIDE TOOL PRODUCTS—*Wilcy's Carbide Tool Co, 1340 W Vernor Hwy, Detroit 1, Mich.* 40-page catalog MT-059 contains complete data and prices for solid carbide; standard blanks, indexable throwaway inserts, on-end inserts, Pentagon indexable inserts, plus toolholders and standard brazed-on single point tools.

16 CUTTING FLUID—*E F Houghton & Co, 303 W Leigh Ave, Philadelphia 33, Penna.* 4-page folder provides information on Hocut 237, a chemical product containing no petroleum. Material, mixed with

(continued on page 233)



What's the limit on cold-headed wire parts?

Some of these items cold-headed from wire exceed the supposed limits of just a few years ago; who can say how far the frontiers of cold-heading will be advanced in the next few years?

The key to cold-heading's phenomenal success is the wire metallurgy. Steel wire for cold-heading is a Bethlehem specialty, and our metallurgists have had years of experience. Bethlehem cold-heading-quality wire is made to rigid standards. It is uniform in analysis and free from injurious surface defects. Thorough inspection, at every stage of production, is behind every ton we ship.

At your invitation we will gladly study your products, equipment and process, and recommend the grade of steel that will perform the best. Then we'll carefully produce the steel to meet your needs.

Bethlehem makes nearly every kind of steel wire. Why not discuss your cold-heading or other production problems with one of our technical men? There are many ways in which our engineers might be able to help improve your production of cold-headed items. Just phone the nearest Bethlehem district sales office, or write direct to the address below.

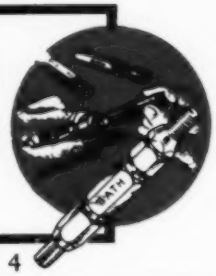
BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL

BATH *Tap'n Gage* TIMES

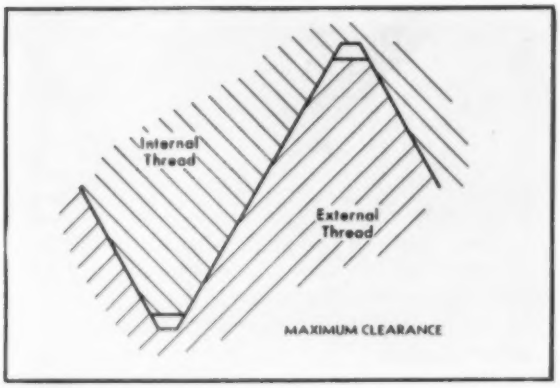


A series of technical discussions that will be helpful in getting better results from tapping and gaging operations

Vol. 1 No. 4

Subject: Pipe Threads and their Applications:

American Standard Taper and Straight Pipe Threads: NPT (National Pipe Taper) and NPS (National Pipe Straight).



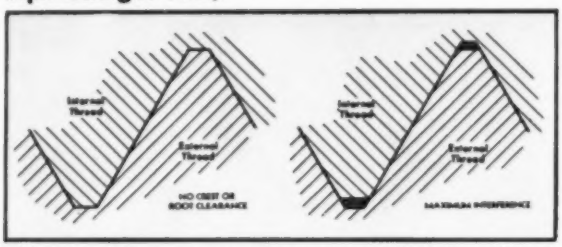
This thread form covers taper pipe threads and various classes of straight pipe threads. Where the fluid or gas pressure is moderate and vibration is no problem, a leak proof pipe thread joint can be made with both external and internal threads tapered; provided that a sealing compound is applied to the thread before assembly. The minimum and maximum limits on truncation and width of flat are the same for both crest and root of both mating threads. The sealing compound fills the clearances between the flats of the external and internal threads to prevent spiral leakage.

For low-pressure commercial products where vibration is negligible, pipe couplings with straight threads (Symbol NPSC) can be assembled with external taper pipe threads (Symbol NPT). A sealing compound is required in this assembly.

Where the threaded joint does not need to be pressure tight or for use in place of a screw thread because of association with pipe threads, free fitting mechanical joints (Symbol NPSM) can be made with straight external and straight internal pipe threads.

For a loose-fitting mechanical joint such as nipple and lock nut assemblies in tanks, the straight pipe lock nut threads (Symbol NPSL) are used. This thread allows the lock nut to be assembled freely to the largest thread it is possible to form on the outside of a standard pipe.

American Standard Dryseal Pipe Threads: NPTF (National Pipe Taper Fuel) and NPSF (National Pipe Straight Fuel).



This thread form covers taper external threads and both taper and straight internal threads. When a sealing compound causes contamination, where the liquid or gas attacks and destroys the sealer, or whenever for any reason a leak proof joint is wanted without use of a sealing compound, the American Dryseal Pipe threads can be used. They have the same basic dimensions as NPT and NPS threads except that the crest flats are of either equal or less width than the root flats. The crest of thread in either complete contact with the root, or crushing into the root, makes the joint pressure tight.

Limits on Crest and Root Flats		
Thds. per In.	Crest	Root
27	.002-.004	.004-.006
18	.003-.005	.005-.007
14	.003-.005	.005-.007
11½	.004-.006	.006-.009
8	.006-.008	.008-.011

Assemblies in which both components have Dryseal Taper Pipe Thread NPTF are generally considered superior for strength and seal to all other pipe forms. Because of this and the ease of production, they have proven successful in many applications where the Dryseal form is not a necessity and where sealing compound is also used. When vibration is present, the Dryseal tapered internal and external threads (NPTF) should be used.

Assemblies of straight Dryseal internal threads (NPSF) with Taper Dryseal external threads (NPTF) are advantageous where economy and rapid production are paramount conditions. They are particularly satisfactory for use when the internal threads are of sufficiently soft or ductile materials to adjust themselves to the taper external threads when properly screwed together.

Aeronautical Taper Pipe Threads: ANPT (Army-Navy Aeronautical Pipe Taper Thread).

Aeronautical Pipe Threads have the same thread form and dimensions as the American Standard Pipe (NPT) except for the 2½" and 3" sizes. All ANPT thread elements are gaged for closer dimensional control. *Additional Pipe Thread Standards having special applications: NPSH-American National Straight Pipe Threads for Hose Couplings and Nozzles; NPSI-Intermediate Straight Pipe Fuel; PTF-SAE Short Taper Pipe Fuel.*

References: U.S. Dept. of Commerce, National Bureau of Standards Handbook H28; 1956 SAE Handbook and MIL-P-7105.

• Cylindrical and Thread Gages • Ground Thread Taps • Internal Micrometers John BATH & Co., Inc.
22 Mann Street, Worcester, Mass.

Free Literature

To order any of these bulletins, circle corresponding number inside back cover.

water, will handle a major proportion of all metal cutting jobs; features include rust protection and lubricity, long life, and freedom from rancidity.

17 PACKAGED CENTRALIZED CONTROL SYSTEMS—*Protection Controls, Inc, 6000 N Legett Ave, Chicago 46, Ill.* 4-page bulletin 159 describes and pictures various custom-engineered control panels which combine a wide range of sequencing, supervising, indicating and power controls for industrial processes, machine automation, and heating applications.

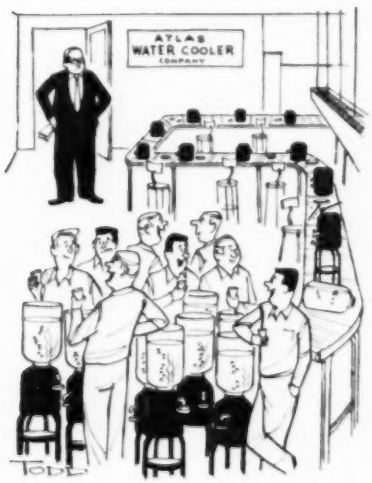
18 MILLIVOLTMETERS—*Minneapolis-Honeywell Regulator Co, Industrial Div, Wayne & Windrim Aves, Philadelphia 44, Penna.* 28-page catalog C10-1 covers operating principles, specifications, features, and ordering information on non-control and control units. Includes information on all control models such as Pyr-O-Vane, pulse Pyr-O-Vane, Protect-O-Vane, and the Pyr-O-Volt controller.

19 SOUND INSTRUMENTS — *H H Scott, Inc, Sound Instrument Div, 111 Powdermill Rd, Maynard, Mass.* Illustrated circular gives details on company's sound level meter, sound analyzer, and other instruments.

HEAT TREATING AND WELDING

20 HEAT-TREATING FURNACES — *Hevi-Duty Electric Co, Milwaukee 1, Wis.* 12-page bulletin 653A contains data on complete range of electric and fuel-fired furnaces and protective atmosphere generators. Covers Clean-Line automatic heat treat unit, and shaker hearth, rotary hearth, conveyor, and pusher furnaces for continuous treating; batch furnaces in variety of types; and tube furnaces capable of operating to 5000 F. Non-ferrous metal melting furnaces, heat processing ovens, forge furnaces, and special heating equipment illustrated.

21 "HOW TO BRAZE STAINLESS STEELS"—*Harper Electric Furnace Corp, 39 River St, Buffalo 2, NY.* 24-page illustrated booklet presents detailed discussion of four aspects of the brazing process: characteristics of base and filler metals;



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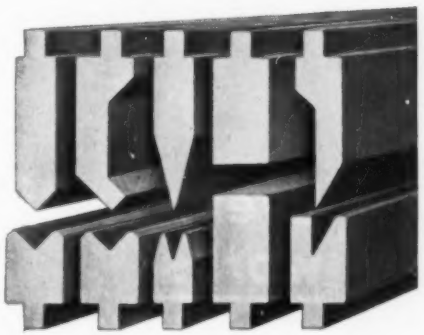

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*Induction Hardened** PRESS BRAKE DIES

This organization of local distributors offers immediate delivery on many CHICAGO *induction hardened* press brake dies. These stock dies are economical, and the quick delivery saves time in tooling. They are available in any length from 4 to 12 feet in increments of 2 feet.

Stock dies are used for a surprisingly large variety of bending operations. And, with CHICAGO *induction hardened* dies you get bonus performance and increased die life at no extra cost. Remember, these dies can be used in any make or size of standard press brake.

On your needs for press brake dies, call your nearest distributor listed here. With Bulletin D-457 you can order by number. Ask for a copy.

*Induction hardening is a special, high-frequency process used to harden the wear surfaces of CHICAGO dies. Field reports on CHICAGO *induction hardened* dies show up to ten times longer life than conventional press brake dies.

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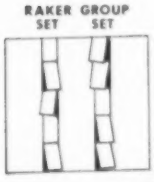
Every tooth works on Disston band saws

Teeth are sized uniformly, milled, then accurately set by machine, on Disston's hard edge flexible back band saws. Result: you can use maximum speeds and feeds, with no sacrifice of a fine finish on completed work.

Furnished with regular and LANCER Hook Tooth pattern. Regular pattern teeth with two sets: Raker Set for general metal cutting, Group Set for thin wall tubing, sheet metal, mouldings.

Available from stock in a full line of widths, gauges, and tooth spaces. See your industrial distributor for more details, or write to *Disston Division, H. K. Porter Company, Inc., 193 Tacony, Philadelphia 35, Pa.*



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To order any of these bulletins, circle corresponding number inside back cover.

brazing cycles; selecting and using gas atmospheres; construction and application of various types of furnaces.

22 TEMPERATURE CONTROL EQUIPMENT—*Blue M Electric Co, 138 & Chatham St, Blue Island, Ill.* 4-page bulletin 1951 illustrates and describes mechanical convection industrial batch ovens, utility ovens, aging ovens, drawer ovens, and environmental cabinets, all incorporating the custom-engineered Power-O-Matic control system that automatically proportions minimum wattage in relation to temperature and work load. Specifications and prices for all units provided in addition to optional accessories.

PLANT SERVICE EQUIPMENT

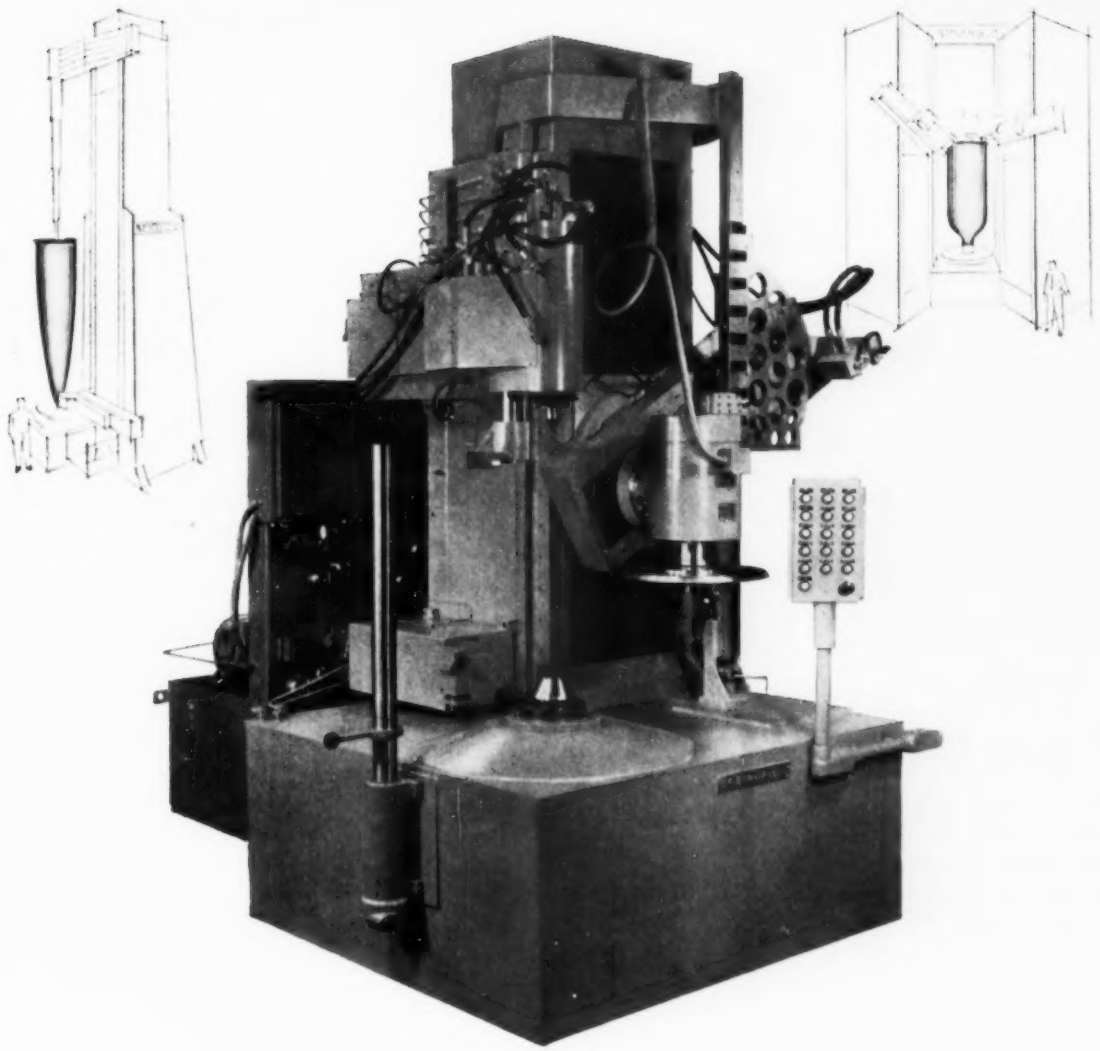
23 INDUSTRIAL TRUCKS SELECTOR GUIDE — *Automatic Transportation Co, 149 W 87th St, Chicago Ill.* 20-page booklet illustrates over 150 models. Selection factors are discussed, such as capacity, frequency of use, power source, and use of semi-standard or special trucks. Individual specifications and features of models given, plus facts on selection of pallets and skids, truck attachments, special die handlers, and tractors.

24 BARREL FINISHING EQUIPMENT —*Almco, Queen Products Div, King-Seeley Corp, Albert Lea, Minn.* 4-page illustrated brochure B-25-C describes 14 standard units, two small barrel models, and 11 specialized barrel finishing machines, plus finishing compounds and media. Design features and specifications included.

25 UNITIZED ALL-METAL CONVEYOR — *M-H Standard Corp, 513-521 Communipaw Ave, Jersey City 4, NJ.* 8-page bulletin illustrates variety of applications and gives description of Armorbelt's features. Specifications and engineering data included.

26 BLADES FOR BLAST CLEANING EQUIPMENT — *Wheelabrator Corp, South Byrkit St, Mishawaka, Ind.* Bulletin contains information on tungsten carbide blades designed specifically for use in Wheelabrator abrasive blast wheels for toughest cleaning applications, even with

"Tomorrow's output around here all depends on you, Jurguson—promise me you won't show up for work?"



Vertical Grinding missile shapes

If you have anything to do with contoured missile shapes you should find out about this brand new breed of machine —the vertical contour grinder. The machine shown above turns and grinds a laminated missile nose whose surface must be smooth and accurate. The point is, this machine was designed for specific missile requirements, and yours may be similar. In vertical grinding the force of gravity works to help achieve concentricity, uniform wall thickness, accurate interior and exterior contours and extreme micro-inch finish. These grinders are designed especially for ceramic, metal, plastic and combinations of materials. Size and weight of workpiece is not limited.

The Springfield Machine Tool Company pioneered the principle of vertical grinding and was one of the first builders to incorporate the principle of hydraulic contouring in a machine tool. These ideas are found in hundreds of machines bearing the Springfield nameplate, and are your best assurance that we can bring to your problem both experience and imagination. Telephone, telegraph or write for informative literature.

THE SPRINGFIELD MACHINE TOOL CO., SPRINGFIELD, OHIO

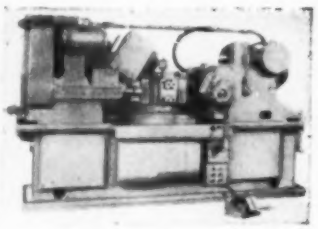
SPRINGFIELD

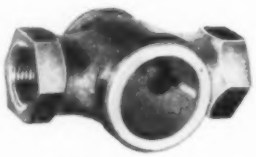
...and parts are finished without rehandling on

GOSS & DeLEEUW AUTOMATIC CHUCKING MACHINES

The Goss & DeLeeuw "One-Two-Three" Chucker differs from the conventional machine in that it provides the means of machining more than one end of a piece in a single handling instead of requiring several handlings and set-ups. A worthwhile gain in production time is assured.

In the "1-2-3", work is gripped in chuck and all ends machined either in sequence or simultaneously. Goss & DeLeeuw and only Goss & DeLeeuw offers this feature in a standard chucking machine.





A few typical parts finished on this machine are shown here. Write for detailed description . . . send samples of your work for time and cost estimates.

GOSS & DeLEEUW QUALITY PRODUCT-QUANTITY SERVICE

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heaviest sand contamination and under the most severe operating conditions. Also contains price information, and lists blast wheel sizes for which the blades are available.

27 LIFT TRUCKS—*Hyster Co, 1003 Myers St, Danville, Ill.* 12-pager covers performance, construction, and maintenance features of new Challenger 60, 70, and 80 pneumatic tire series. Capacities range from 6000 to 8000 lbs at 24-in. load center. Cutaway view shows all machine components; attachments and accessories listed.

28 STORAGE RACKS—*Lamson Corp, Syracuse 1, NY.* 4-page bulletin R-100 illustrates and briefly describes some of the gravity racks available for live storage and order picking applications.

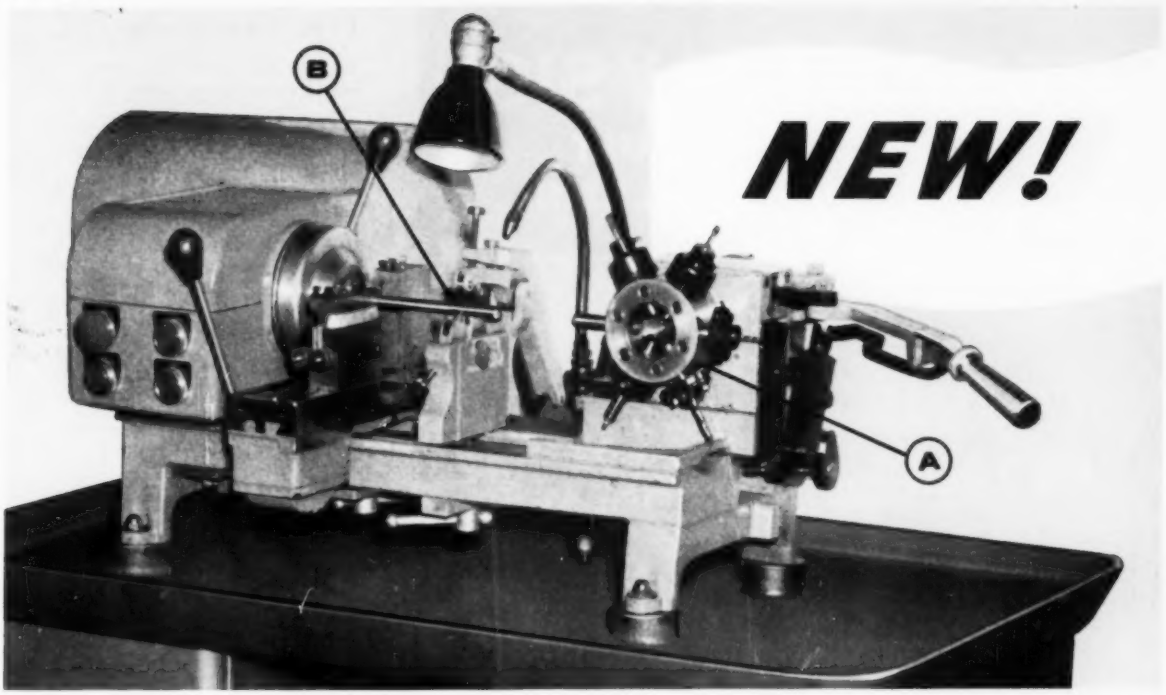
29 CUSTOM CONTROL CENTERS—*Control Design and Fabricate, Inc, 30725 Twelve Mile Rd, Farmington, Mich.* 4-page brochure contains information on Condeco equipment for all types of automation systems and automatic machinery. Models illustrated include unit used in automatic material handling systems and in all types of industrial assembly line operations; model designed for fully automatic order-filling systems in warehouses; and a loading station control center that automatically loads materials into proper storage lines.

30 FLOTATION SYSTEMS—*US Hoffman Machinery Corp, Industrial Div, Thompson Road Plant 1, Syracuse, NY.* 4-page bulletin FB-102 describes units for clarification of water soluble oil coolants in metalworking operations. Models are available for flow rate from 50 to 1500 gpm.

31 MAINTENANCE COATINGS — *Union Carbide Plastics Co, Division of Union Carbide Corp, New York, NY.* 5-page technical bulletin, Coatings Technical Release No. 38, describes a new phenolic/vinyl system of maintenance coatings for metals. Explains how the system eliminates need for costly surface preparation by sandblasting. Formulation methods and exposure test data of panels coated are included.

32 SAFETY GRATING — *Globe Co, Products Div, 4000 S Princeton Ave, Chicago 9, Ill.* 24-page catalog 5911 presents illustrated description of Safety Grip Strut Grating, of one-piece construction in

"Why no, I didn't tell the foreman you were a jerk. I thought he knew."



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CHALLENGE .625" PRECISION TURRET LATHE

for faster handling of secondary operations or short runs on small precision parts

Look at these important new operating features:

(A) AUTO-INDEX TURRET

Vertical turret automatically returns to starting position when operating lever is lowered, eliminating need for operator to index through all positions to return to starting position. Number of work stations desired can be preset.

(B) AUTOMATIC STEADY REST

Steady Rest automatically opens when turret indexes back to starting position, speeds removal of work pieces.

You'll want to know all about these and many other cost cutting features of the Challenge 625 . . . push button control, easy collet operation, two-post cross slide.

Rigid steel stand is integral part of machine, houses coolant tank and pump. Entire machine is 42" long, 25" wide, 51" high, occupies minimum floor space.

TL-101

Available through selected machine tool dealers. For complete information, write today.

Challenge

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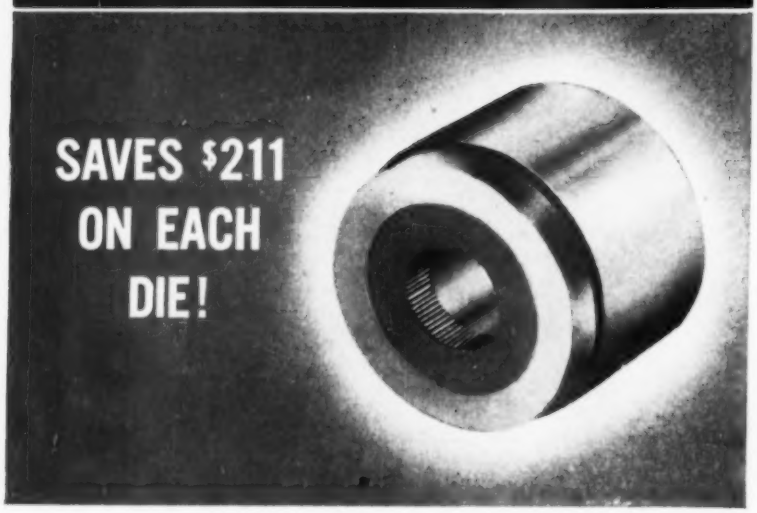
FREE ANALYSIS
OF YOUR DIFFICULT MACHINING PROBLEMS



PROBLEM: reduce costs of machining this carbide knurling die. **SOLUTION:** A **Raytheon Impact Grinding Analyst** recommended producing the serrated portion of the die with a Raytheon Impact Grinder. **RESULT:** the die, formerly made by conventional methods and costing $265 each is now produced for $54—saving $211 per die.

HOW YOU CAN BENEFIT—

Whatever your difficult cutting, slicing, drilling, engraving or shaping problems in hard or brittle materials—carbides, ceramics, semi-conductors—a Raytheon Ultrasonic Impact Grinding Analyst stands ready to help you solve it—without cost or obligation. For full details, mail the coupon below—today!

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MAIL THIS COUPON FOR FREE ANALYSIS —without cost or obligation.

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☐ Please send me literature on Raytheon Impact Grinders.

☐ Please have a Raytheon Impact Grinding Analyst contact me.

My problem is: (describe metals or non-metals involved, tolerances, etc.)

_____

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NAME_____

COMPANY_____

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steel, aluminum, and stainless; also Gold Nugget welded grating for greater rigidity and strength. Shows installations, provides complete engineering data for erection, plus load charts for both products. Additional 4-page Safe-Gard catalog covers new expanded metal partition panels with Quick-Erect fittings for easy method of guarding conveyors, machines, and for all inplant partitions.

PARTS AND MATERIALS

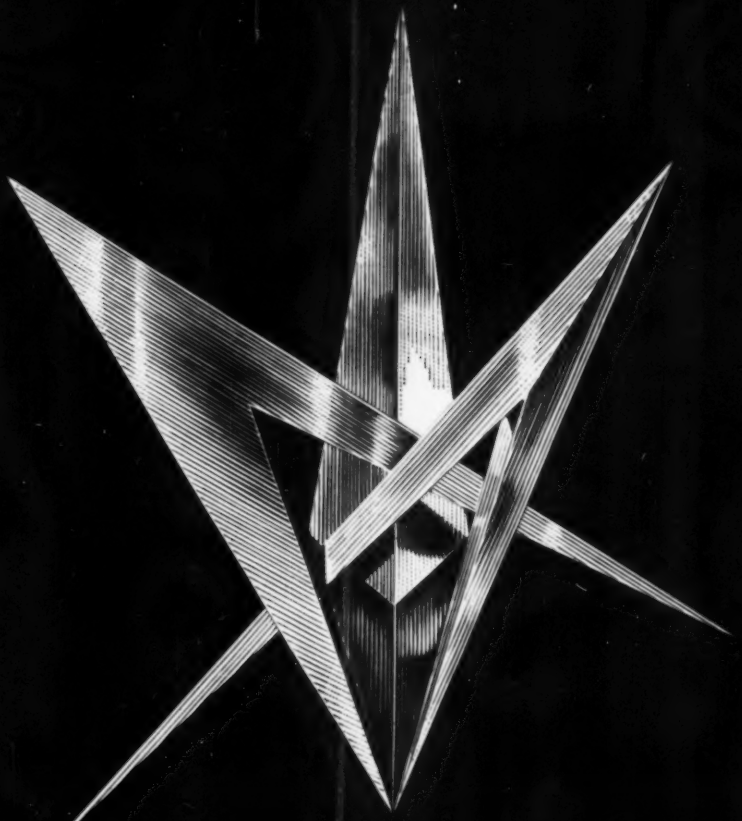
33 MOTOR APPLICATION GUIDE—*Century Electric Co, 18th & Pine Sts, St Louis 3, Mo.* 16-page 1959 Application Guide (Form 270A) discusses nine major factors in motor selection; polyphase, single-phase, and dc motor selection charts describe typical motor-driven equipment, show starting and running torques for such equipment, load characteristics, type of motor to use on the equipment. CE's motor type and description of the motor. Gearmotor line, selective speed drives, mechanical variations and special applications are described.

34 STAINLESS STEEL MACHINING DATA — *Kennametal Inc, Latrobe, Penna.* 8-page bulletin gives feeds, machining speeds, and grades of carbide cutting edges best suited for roughing, semi-finishing, and fine finishing 188 compositions of stainless types from 201 to 502. Includes brief discussions of austenitic, ferritic, and martensitic materials, and of tool geometry and coolants. Also gives Kennametal's diagrammatic method of matching its grades with machining conditions.

35 SINTERED NYLON PARTS—*Halex Corp, c/o Polymer Corp, 2120 Fairmont Ave, Reading, Penna.* 4-page brochure BR-11 covers Nylasint nylon parts, nylon components formed by cold pressing and oil sintering nylon powders in a process similar to that used in forming powder metal parts. New type of Nylasint is also described. Includes property and application data on standard oil-impregnated parts with inorganic fillers designed for new or improved uses for nylon as compared to injection molded nylon.

36 ADJUSTABLE SPEED DRIVES—*American Pulley Co, 4200 Wissahickon Ave, Philadelphia 29, Penna.* 4-page bulletin WRB-58 gives information on operation and application of wide-range, adjustable-diameter, wedge-belt sheaves. Installation and mounting dimensions are

"According to this, you are a spot welder. You work a couple of weeks in one spot, get fired, and move to another."



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IN STAINLESS STEEL

"FLIGHT OF PROGRESS"
a stainless steel sculpture by Robert Edward Hamilton

In the past 12 months 91% of all orders for J&L stainless steel bars were shipped, *at least* in part, within 24 hours.

That's service!

The key to such service is a simple one: Complete and balanced inventories at the Mill *and* at strategically located Service Centers only hours from *your* plant or warehouse.

With the most modern flat rolling facilities in the industry now in operation at Louisville, Ohio, J&L is now giving the same service on flat rolled products that fabricators and warehouses have been getting on J&L bars and wire.

Whether you need stainless sheet, strip, bar or wire for your production line or your warehouse customers, *you can get it faster from J&L.*

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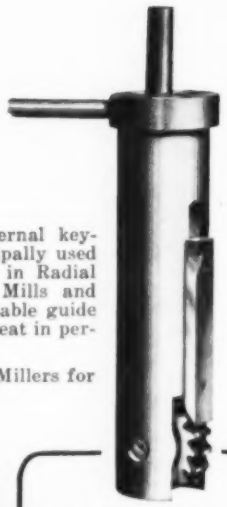
NATIONAL
Keyseating Millers



NATIONAL Keyseating Millers are mechanically simple in construction, sturdily built, designed for milling internal keyseats, faster and better. Although principally used in Drill Presses they can also be used in Radial Drilling Machines, Horizontal Boring Mills and Milling Machines. An exclusive demountable guide on body of Miller assures a straight keyseat in perfect alignment with axis of bore.

You can depend on National Keyseating Millers for all your keyseating jobs.

national
MACHINE TOOL CO.
CINCINNATI 22, OHIO

WRITE TODAY
for Catalog No. 17 complete, handy size

CIRCLE 351 READER SERVICE CARD

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FOR GREATER PRODUCTION • EFFICIENCY • SAVINGS

Use rugged, reliable "Hole Hog" machine tools for such jobs as:

★ Multi-Spindle Boring ★ Single and Multi-Spindle Honing
★ Straight Line Multi-Drilling ★ Adjustable Spindle Drilling
★ Vertical and Way-Type Fixed Center Drilling, Boring and Tapping
★ Special Multiple Operation Machine Tools

Twenty-Station, Ten-Unit Transfer Machine for boring, counterboring, chamfering and valve clearance operations on V-8 automotive engine blocks. (Shown)

Over 58 years of MachineTool Engineering experience is at your service. Tell us your particular problem.

MOLINE TOOL COMPANY
100 20TH STREET • MOLINE, ILLINOIS
REPRESENTATIVES IN PRINCIPAL CITIES

Free Literature

To order any of these bulletins, circle corresponding number inside back cover.

listed for both the adjustable diameter and companion sheaves. Auxiliary equipment described.

37 FASTENERS — *Standard Pressed Steel Co, Box 375, Jenkintown, Penna.* 8-page bulletin (Form 2449) describes complete line including socket screw products, pressure plugs, locknuts, spring pins, dowel pins, and steel collars. Includes specification information on Unbrako, Flexloc, Sel-Lok and collar lines, plus basic data on types, sizes, threads and plating, design features, and application information.

38 AC MOTOR SELECTOR—*Reliance Electric & Engineering Co, 24701 Euclid Ave, Cleveland 17, Ohio.* 12-page bulletin 2103-4 presents selection data on motors from one through 200 hp. Includes brief explanations of NEMA design classes, speed-frequency relationship, current and torque values, as well as frame selection tables and dimension information for standard frames, and mechanical modifications for all frame sizes from 182 through 6085.

39 TUBE FORM MOUNTING AND DYNAFLEX JOINTS—*Lord Manufacturing Co, 1635 W 12th St, Erie, Penna.* 12-page bulletin 713 describes and pictures products specially engineered for vibration and shock control. Contains application guide, performance characteristics and data, detailed specifications, methods used for selection and installation.

40 END USES OF ZINC DIE CASTINGS—*New Jersey Zinc Co, 160 Front St, New York 38, NY.* 62-page edition contains illustrated descriptions of many new applications of Zamak alloys.

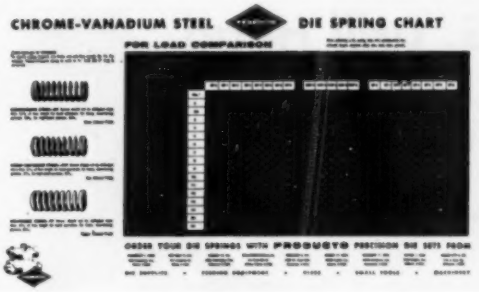
• NOZZLES—*Wm Steinen Mfg Co, Industrial Nozzle Div, 45 Bruen St, Newark 5, NJ.* 32-page catalog presents complete listings and data on all types of nozzles for industrial spraying applications. Selection tables give specific data on spray angles, dimensions, types of connections, and capacity vs pressure for all standard units. Illustrations provide specific details of flow and spray patterns attained with each type. Application section included. Request direct on company letterhead.

DIE SET DATA

available from PRODUCTO

Die Set Catalog No. 11

This easy-to-use general catalog contains compact, complete listings and illustrations of Producto's broad line of die sets and die makers' accessories. There's a separate price book with *net* prices. A unique new binding enables you to have the technical data and price information side-by-side—no flipping back and forth required. *Color* spotlights key information and speeds up your use of the catalog. Many important new accessory items are included. Free.*

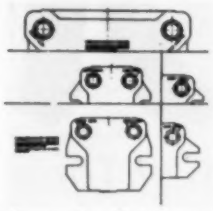


Die Spring Comparison Chart

Die spring selection is simplified by this 12" x 20" chart in two colors, suitable for wall mounting. Convenient for use at the drawing board, bench or in the stockroom. Covers all three series of Producto chrome-vanadium die springs: Medium-pressure 50% deflection, Medium high-pressure 37% deflection, and High-pressure 30% deflection. Free.*

Die Set Digest

Every issue of this 8-page quarterly publication is packed with valuable hints for designers, manufacturers and users of dies. Hard-to-find information is presented clearly in the *Digest:* "Die Set Maintenance in the Pressroom"; "How to Select and Use Die Springs"; "How to Lubricate for Longer Life". Write and ask to receive *Die Set Digest* regularly. No charge.*

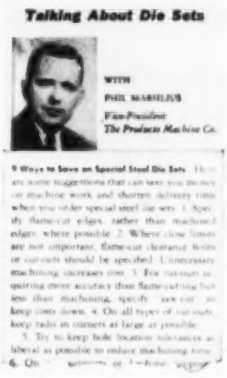


Die Set Templates

Accurate full-size templates for Producto rear-pin die sets. Save time and simplify layout for the busy die designer. $3.50 set. Write today.

Die Set Specification Stamp

Rubber stamp for tracings, prints. Provides spaces for die set ordering information. Free.*



Ad Reprints

Valuable die set know-how is provided in recent "Talking About Die Sets" columns: *How to Save on Steel Specials, Steel vs. Semi-steel,* and others. Send for complete file, free.*

*WRITE TODAY for these useful and informative diemaking aids. Requests on company letterheads will be filled promptly.

PRODUCTO

THE PRODUCTO MACHINE COMPANY
975 Housatonic Avenue, Bridgeport 1, Connecticut

Wherever die sets are used

PRODUCTO

PRODUCE MORE WITH PRODUCTO PRECISION DIE SETS

Now you can do <u>both</u> . . .

SHORT RUNS

LONG RUNS

. . . Drilling and/or Tapping . . .

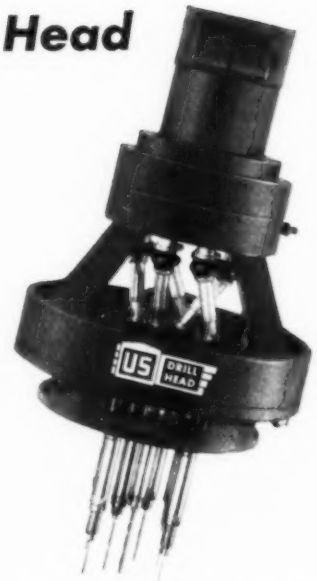
with ONE adjustable U. S. Drill Head

Complete versatility for job shop operations with standard adjustable arms . . . or, equip these heads with U. S. Slip Spindle Plates which are jig-bored for positive alignment to fit the hole pattern. Eliminates trial-and-error in set up.

Double Duty Tools—when your drilling machine has a reversing spindle, you can drill and tap the same hole pattern with one head.

U. S. Drill Heads are fast and rugged—designed and built for profit-making performance. Positive all-gear drive with shaved gears, anti-friction bearings, and oil-tight housings assure smooth and accurate operation.

Ask for Catalog AD-57, or send specifications of your requirements.



Slip Spindle Plates may be jig-bored for more than one pattern of holes.

US DRILL HEAD

Adjustable and Fixed Center Multiple Drilling Heads.
Individual Lead Screw Multiple Tapping Heads.

UNITED STATES DRILL HEAD CO.

BURNS STREET • CINCINNATI 4, OHIO

Swan E Bergstrom (left) has been elected president of Cincinnati Milling and Grinding Machines, Inc, sales subsidiary of Cincinnati Milling Machine Co. **Robert C Bevis**, sales manager, has been named a vice president. Mr Bergstrom is president of the parent company

Kingsley C Drone has been appointed chief engineer of Clearing Machine Corp's Aircraft & Missile Division. He has been chief engineer of Hufford Corp for the past seven years

NAMES IN THE NEWS...

Royden Walters has been elected vice president of Saco-Lowell Shops, Boston. Previously associated with Borg-Warner Corp, he joined Saco-Lowell last year as executive assistant to the president.

Thomas G Barnes, vice president, sales, of Firth Sterling, Inc, Pittsburgh, has taken over the duties of vice president and general manager of the Carbide Division, recently set up in an organizational realignment separating carbide and steel operations. Mr Barnes will direct both sales and production activities of this division of the company. **R K Hopkins** has been elected a vice president of the company and will also serve as chairman of the research committee of the Steel Division.

Harold W Blakley has been appointed general manager of the Citco Division of Canada Illinois Tools Ltd, Canadian subsidiary of Illinois Tool Works of Chicago. Mr Blakley has previously been associated in sales and management positions with Babcock-Wilcox, and York-Shipley of Canada. **John D Hughes** has been named general sales manager of Citco. He has been associated with the division for several years in sales capacities.

Harold Ulmer has been appointed assistant to the vice president and manager of Hughes Aircraft Co's Products Group. Mr Ulmer was formerly president of Vacuum Tube Products Co, Oceanside, Calif, firm recently acquired by Hughes.

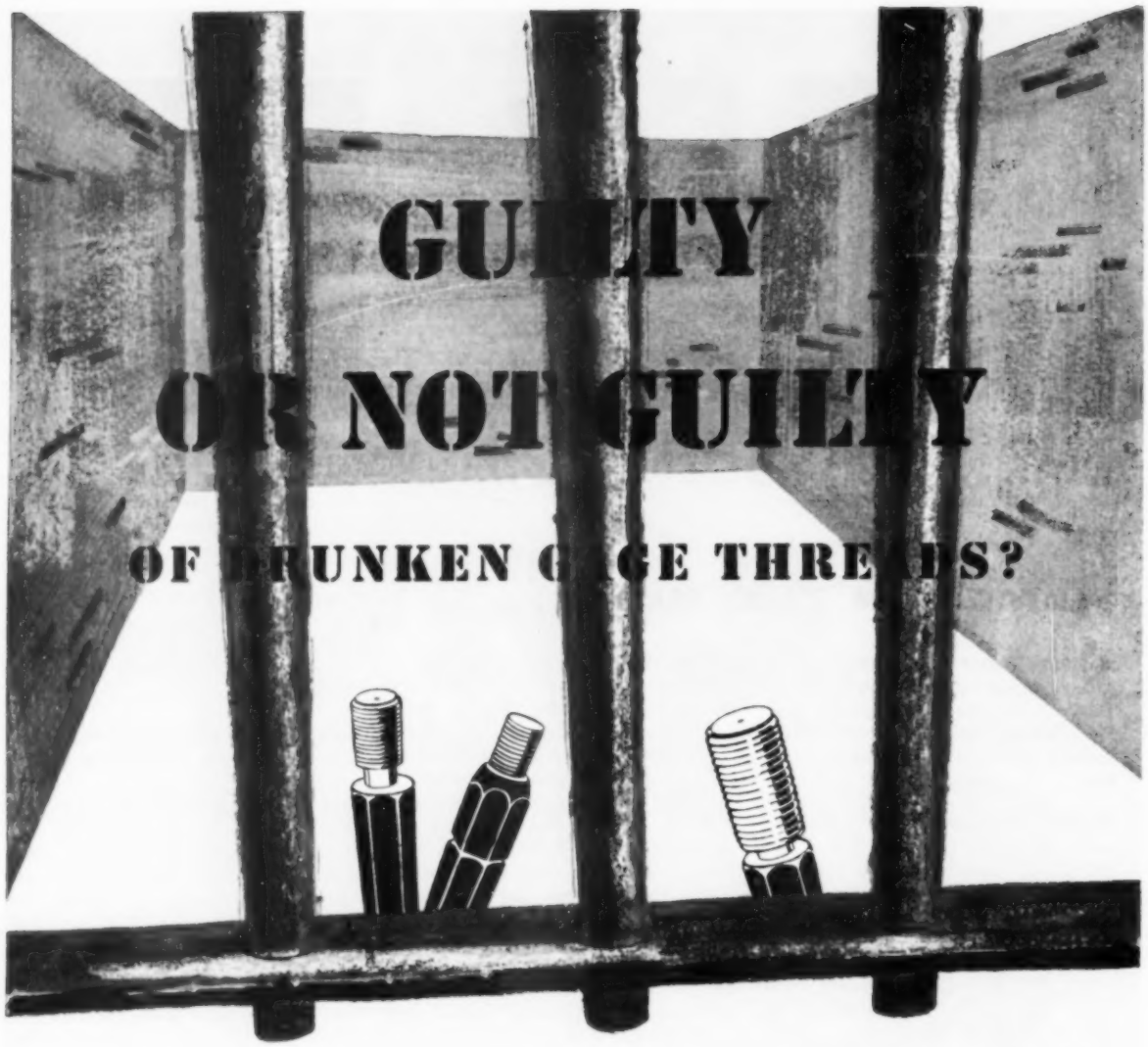
George F Hannaum, director, industry planning service, Aircraft Industries Association, has been named assistant general manager of the Association.

Dr Charles E Reed has been named general manager of GE's Metallurgical Products Department in Detroit. He succeeds **Kenneth R Beardslee** who becomes a consultant for the department. **Jerome T Coe** takes over Dr Reed's former post as manager of the Silicone Products Department, Waterford, NY. He was formerly marketing manager. **Thomas J March** has been appointed manager of sales for the department. He succeeds **John T Castles** who has been made general manager of the chemical development operation of the company's Chemical & Metallurgical Division.

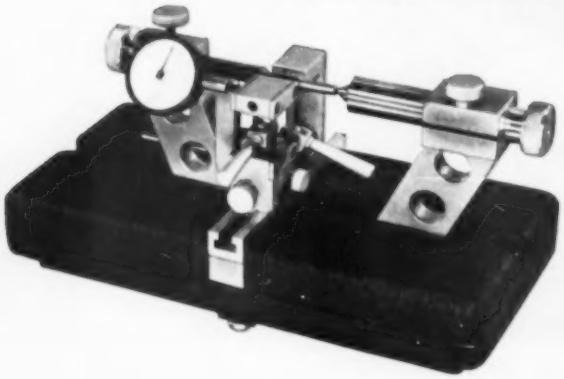
(continued on page 245)

Harold A Johnson (left) has been elected vice president, engineering and manufacturing, of Barnes Drill Co, Rockford, Ill He has been associated with the firm since 1938 in engineering and production capacities. **H L Cogswell**, general sales manager, has been named vice president, sales and service, of the machine tool, coolant cleaning equipment, and honing divisions

Harvey Riggs, president of International Electronic Research Corp, Burbank, Calif, has been elected president of the strategic Industries Association, Los Angeles



You Be The Judge With A Pipe Machinery Drunken Thread Checker



Put your gages on trial with a Pipe Machinery Drunken Thread Checker. Get a quick accurate verdict—a direct reading of the degree of helix deviation or drunken thread—then pass sentence accordingly. If the deviation doesn't exceed Standard Specifications you release the suspect gage for further use; if not, you condemn it instantly and positively.

Simple to set up and operate, the Pipe Machinery Drunken Thread Checker may be used on any work bench in any department.

Write today for complete details.

THE PIPE MACHINERY COMPANY • *29100 Lakeland Blvd.* • *Wickliffe, Ohio* • *Greater Cleveland*

NAMES IN THE NEWS...

Emmett Shutts, executive vice president of Hartford Steel Ball Co, West Hartford, Conn, has been elected president of the company.

Donald A MacRitchie, vice president and general manager of the Artisan Metal Works Co, Cleveland, has been elected president. Producer of precision electronic gear chassis and enclosures, company is currently engaged in component fabrication for the Bomarc and Talis missile programs.

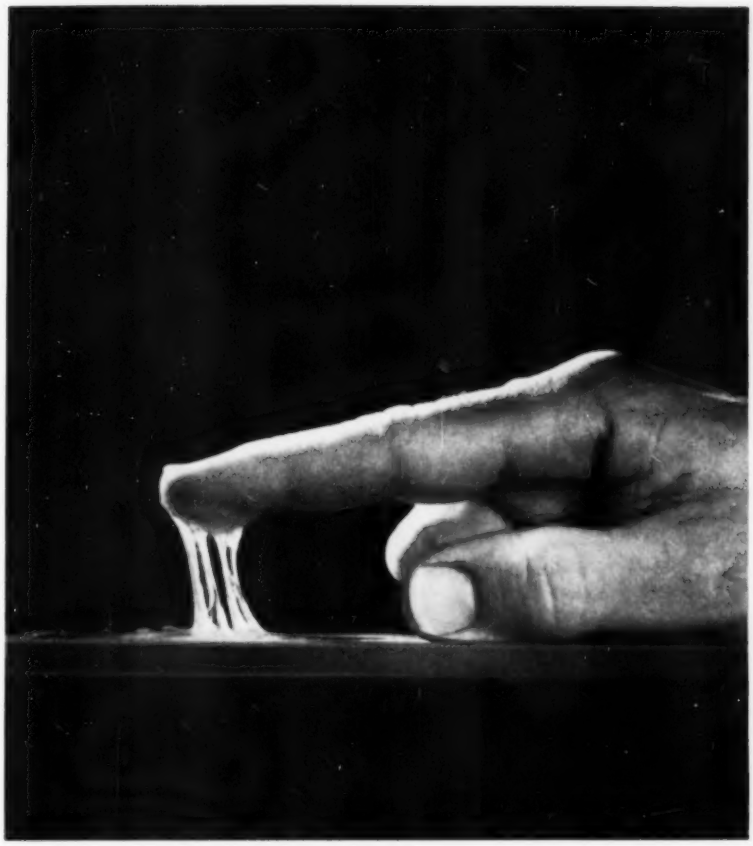
Dr Willard R Sittner has been appointed manager of Sperry Rand Corp's Semiconductor Division, South Norwalk, Conn. Dr Sittner, a veteran of 20 years' experience in engineering, production, and research in electronics, solid-state physics, and related fields, will head a division specializing in new solid-state electronics devices for computers, weapon systems, and other advanced military equipment.

C W Trautman, formerly manager of test equipment engineering for Bendix Products Division in South Bend, Ind, has joined the George L Nankervis Co, Detroit, as manufacturing manager. Company designs and makes custom-built equipment for testing all types of hydraulic, pneumatic, electrical, and mechanical products.

George C Mott, formerly production control manager with Ford Motor Co, has joined Hamilton Standard, division of United Aircraft Corp, as production control manager. He will be responsible for correlation of production programming and scheduling at the Windsor Locks plant.

Robert W Pressing has been appointed general manager of the New Products Department of Linde Co, Division of Union Carbide Corp, New York. He was formerly manager of molecular sieves production and development at Linde's Tonawanda, NY, plant.

Harold F Tolnitch has been appointed sales manager of machine knife products and **Thomas Earl Douglass** sales manager of grinding wheel products for Simonds Worden White Co, Dayton, Ohio. Mr Tolnitch was formerly assistant sales manager and Mr Douglass served as assistant to the president.



What's glue got to do with the price of finishing?

Stuck? Then you'll be interested to learn that glue is but one of several bonds used to hold the cutting grains to the backing in the manufacture of coated abrasives. Varnishes and resins are also common bonding materials. The problem is to select the proper bonding material to assure maximum belt life. Jewel Brand Abrasive Engineers know, for example, that glue is commonly recommended for dry, low heat applications while resins are usually required where toughness and resistance to water, heat and high working pressures are in demand. Their ability to recommend the proper bonding material often results in substantial savings in time, labor and materials. It will pay you to put their knowledge to work for you. Write for complete details. Abrasive Products, Inc., 561 Pearl Street, South Braintree, Mass.

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rolls
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ABRASIVE PRODUCTS, INC., South Braintree 85, Massachusetts

CIRCLE 356 READER SERVICE CARD

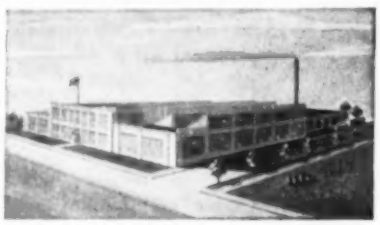
Here's how CDT can help you

CDT CAN INCREASE YOUR PRODUCTION
. . . because CDT specializes in designing and building tools and machines for today's high production demands.

CDT CAN IMPROVE YOUR QUALITY
. . . because CDT tools, jigs, fixtures and machines are precision engineered and built to the strictest requirements.

CDT CAN LOWER YOUR PRODUCTION COSTS
. . . by increasing the efficiency of your operation with special tools that do the job better—faster—more economically.

Call on Columbus Die-Tool for your special tooling problems. A large creative engineering staff with experience in developing special tools and machines for hundreds of industries is at your service. Over 50,000 square feet filled with precision production equipment enables us to build fine tools and special purpose machines to exacting requirements. Avail yourself of the industry-wide experience of Columbus Die-Tool.



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Designers and manufacturers of JIGS • FIXTURES • SPECIAL TOOLS • UNITS FOR MACHINE TOOLS • *also Builders of Machine Tools Complete*

NAMES IN THE NEWS...

Edward O Vetter has been elected executive vice president of Metals & Controls Corp, Attleboro, Mass. Mr Vetter was formerly associated with Texas Instruments, Inc, as an assistant vice president in charge of the Houston, Texas, based Industrial Instrumentation Division.

P E Savage has been named vice president of the Eastern Region of Dominion Bridge Co, Ltd, Montreal. Company has replaced its divisional setup with four territorial regions. Additional appointments: **Mackenzie McMurray,** vice president, Ontario Region; **E A Ford,** vice president, Central Region; and **R J A Fricker,** vice president, Western Region. **Robert S Eadie,** formerly vice president and manager of the Eastern Division, has been named vice president and director of engineering.

Wesley E Niemond has been appointed head of Stromberg-Carlson's Tape Center Department at the Electronic Control Systems facility in Los Angeles. Stromberg-Carlson is a division of General Dynamics Corp. Prior to joining S-C Mr Niemond was a member of the technical staff in charge of the automation development planning and tooling program of Hughes Aircraft's Products Group.

E W Zoller, manager of the Rochester, NY, plant of Pfaudler Permutit Inc, has been named manager of domestic manufacturing operations of the Pfaudler Division. **Thomas Griswold** has been made manager of the Elyria plant, replacing Vice President **George C Calvert** who is moving to Rochester to supervise all PP Western Hemisphere operations outside of the US.

Howard B Upham has been named district manager of the Cincinnati branch office of Pratt & Whitney Co. Formerly district sales manager of cutting tools and gages, he replaces **James H Daley,** recently appointed domestic sales manager of the Machine Tool Division. **Arthur LaDucer,** previously on the sales staff of the Chicago office, has been transferred to Cincinnati as district sales manager of machine tool sales.

Robert J Ogden has been made manager of screw machine stock sales for Aluminum Co of America. He has been a member of the sales staff since 1946.

use Airco's new Dip Transfer† *CO_2 Process***

for **ALL-POSITION WELDING OF STEEL IN ALL THICKNESSES**

low costs • easy fit up • high speed • very low spatter • no warpage

In welding mild sheet steel manually, there's only *one way to reduce costs and produce high quality welds* at the same time. Airco Dip Transfer CO_2 Process Welding. Let's be specific: –

- The complete Airco Dip Transfer CO_2 package welds in all positions . . . manually!
- Welds are hydrogen-free.
- Virtually ends warpage – only low average currents are used for burn off.
- Creates little or no spatter.
- Handles typical steel joint fit ups.
- No flux needed.
- Penetrates deeply – critical for high quality.
- Welds much faster than flux-based processes.
- Uses money-saving Pureco CO_2 as shielding gas.
- The basic equipment welds all weldable metals.

The Airco Dip Transfer CO_2 Process gives you consistently *high quality* welds at *lower costs* than any other process. For complete information, phone or write your nearest Air Reduction Representative. Ask for the new 24-page "AIRCOMATIC CO_2 WELDING" Catalog.

Visit our booth 521—April 7-8-9 at the Welding Show—International Amphitheatre, Chicago, Ill.

Pureco CO_2 is supplied by the Pure Carbonic Company, a division of Air Reduction Company, Incorporated.
†Trademark
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NAMES IN THE NEWS...

Robert E Parrett, formerly plant manager of Kwikset Locks, Inc, has joined American Hardware Corp, New Britain, Conn, as vice president and director of manufacturing operations.

John A Maxwell, Jr, Temco Aircraft Corp's vice president for contracts, sales, and programming, is transferring to Los Angeles to handle production operations for Fenske, Fedrick & Miller, Inc, a subsidiary that manufactures electronics systems.

Frank W Welling has been elected vice president of Commercial Filters Corp, Melrose, Mass. Prior to joining the firm Mr Welling was vice president of W A Case & Son Manufacturing Corp, Buffalo.

Joseph R Carter, formerly associated with Sharon Steel Corp, has been appointed general manager of Wyman-Gordon Co's Eastern Division, consisting of Worcester and North Grafton, Mass plants. **Robert E Zell** has been named manager of the Harvey, Ill, plant.

Kurtz M Hanson has been elected president of Lanston Industries, Inc, Philadelphia manufacturer of typesetting and typecasting machinery. He was formerly president of Champion-International Co, Lawrence, Mass.

Robert A Manogue has been named product manager, Pump and Controls Division, of American Brake Shoe Co's Denison Engineering Division, Columbus, Ohio. Formerly manager of Denison's southwest regional office, Mr Manogue succeeds **Ellis H Born,** appointed director of sales engineering.

Robert M Buck, president and general manager of Bryant Industrial Products Corp, Cleveland, has been elected chairman of the Combustion Equipment Division of the Industrial Heating Equipment Association.

William V Shakespeare, assistant to the president of Cincinnati Rubber Manufacturing Co, has been elected a vice president of the company. Firm, which is a division of Thor Power Tool Co, Aurora, Ill, manufacturers conveyor and transmission belting, hose, rubber covered rolls, and associated rubber products.

CIRCLE 359 READER SERVICE CARD

CIRCLE 360 READER SERVICE CARD ►

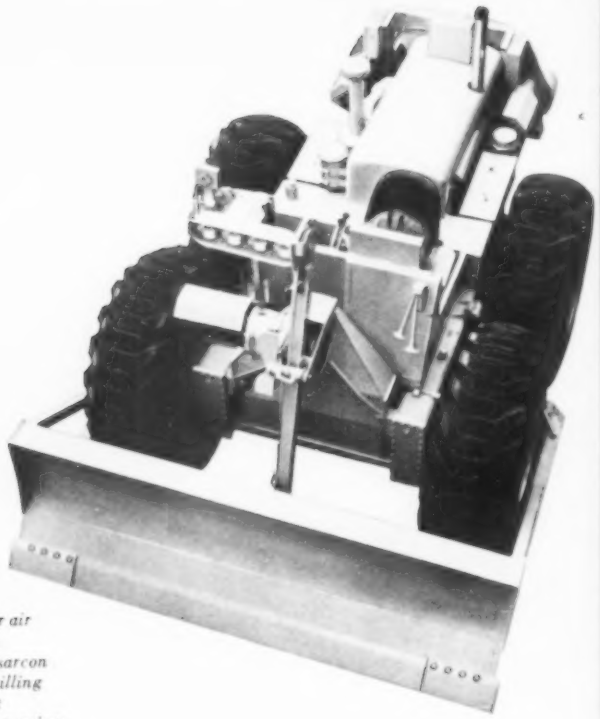
ASARCO

"the fast way out of today's profit squeeze

is through the use of more efficient materials which cost less to machine and fabricate, yet produce a better product..."

i. e. Asarcon® Continuous-Cast Bronze

SEE NEXT PAGE



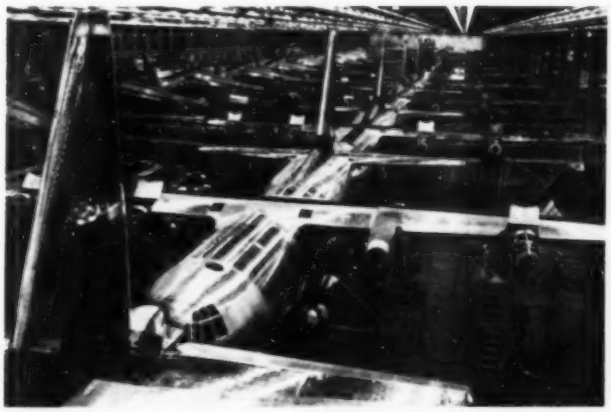
Cushion collars for air cylinders cut from continuous-cast Asarcon tubes eliminate drilling operation, also cut costs of finishing, turning and grinding collars to very close tolerances.

Design for full production efficiency:

Motor-drive clutch-ratchet shaft bearings in various Remington Rand calculating machines are continuous-cast from Asarcon 773 Bearing Bronze. These bearings test out 33% higher in impact strength to their sand-cast predecessors!

Easy machining and longer wear governed the choice of Asarcon bronze for the worm gears and guide bushings on this power belt sander.

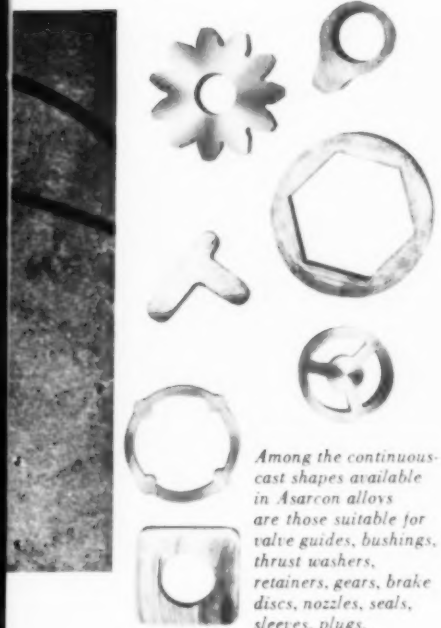
Asarcon bronze, as power transmission bearings in heavy duty equipment, improves performance, extends service life.



Asarcon bronze bearings act as seal against 3000 pounds of oil pressure in control assembly in Lockheed's C-130. These bearings save space, weight. Their great uniformity gives low friction, high load capacity.

ASARCO

CONTINUOUS-CAST BRONZE CASTINGS



Among the continuous-cast shapes available in Asarcon alloys are those suitable for valve guides, bushings, thrust washers, retainers, gears, brake discs, nozzles, seals, sleeves, plugs.

Lower material costs, faster production, better products. Certainly a powerful set of reasons for evaluating Asarco's unique process of casting shapes in continuous lengths. The alloys produced by continuous casting are in accord with SAE, ASTM, and government specifications but their performance is demonstrably superior to similar alloys cast other ways. So superior in hardness, tensile, yield, and impact strength, that you may be able to substitute an Asarcon bronze for a high-cost aluminum—or manganese bronze. You get the shape you need in the exact lengths you need, with minimum clean-up necessary, machinable on high speed machines.

Before you design or produce a copper base part, investigate the economy and efficiency of continuous-casting. From a simple sketch, Asarco can tell you whether or not your part can be economically made from a continuous-cast alloy. Call in your nearby Asarco representative or write to Continuous-Cast Products Department, American Smelting and Refining Company, Barber, N. J. West Coast Distributor: Kingwell Bros., Ltd., 457 Minna St., San Francisco. In Canada: Federated Metals Canada, Ltd., Toronto and Montreal.

AMERICAN SMELTING AND REFINING COMPANY

Cut your bearing costs 5 ways with

Asarcon 773 (SAE 660) *Continuous-Cast Bearing Bronze*

260 sizes of rods and tubes. Complete range of sizes from 1/2" to 9" diameters. Immediately available from stock in 105" lengths. Special shapes produced to order.

1. No short-end scrap as from ordinary cast bars. Your Asarcon distributor will cut to requirements. You get *exact* lengths you need. Up to 105".

2. Less diameter loss. Asarcon 773, in a complete range of sizes, comes closer to finished dimensions. Only 1/32" to 3/32" to machine off.

3. Less machining. Less stock to remove means less machining time and cost.

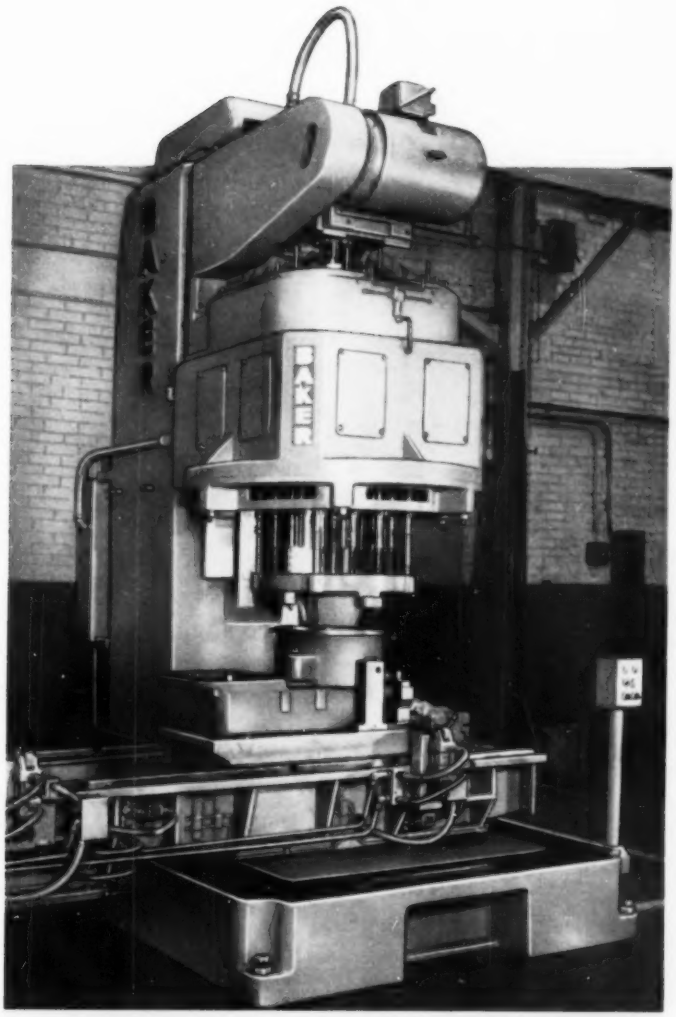
4. No loss of machining time, no parts thrown away because of metal defects. Every casting unconditionally guaranteed to be free of blow holes, pits or shrinks. No sand to dull tools. No hard or soft spots.

5. Less down-time. The better, more uniform properties of Asarcon 773 assure longer life of important machine parts and few breakdowns.

Order Asarcon 773 from stock in 260 sizes, solids and tubes, any length up to 105", from a national network of distributors. Write for address of nearest stock point and complete data, to Continuous-Cast Products Department, American Smelting and Refining Company, Barber, N. J. West Coast Distributor: Kingwell Bros., Ltd., 457 Minna St., San Francisco. In Canada: Federated Metals Canada, Ltd., Toronto and Montreal.

ASARCO

A special machine job done by a STANDARD BAKER®



Baker A-24-VU Adjustable Spindle Machine with standard 36" round universal head and standard slip plate bored for 46 spindles.

ADJUSTABLE SPINDLE MACHINE

An automotive contractor's production did not allow for a special machine to work on heavy, hard-to-handle truck transmission housings. Conscious also of retooling costs, the contractor took his problem to the BAKER engineers.

THE RESULT: This A-24-VU Standard Adjustable Spindle Machine, with a few special adaptations. Only accessories added: slip plate, bushing plate and transfer, including pallet.

The work piece is held on a pallet which transfers it from prior operations where the top flange of the housing is completely machined. The BAKER drills 2 sets of bolt circle holes on the top flange and 1 set at the housing bottom. A bushing plate, supported on the slip spindle plate, guides the drills and targets into bushings on the pallet for positive location.

Using this BAKER Standard, the contractor saved special machine costs, gained the high production needed and found it simple to take the BAKER out of the transfer line and use it for other drilling and tapping operations.

For the complete story on how Baker Standard Adjustable Spindle Machines can solve your special production problems, write Baker Brothers, Inc., 1000 Post Street, Dept. AH-359, Toledo 10, Ohio.

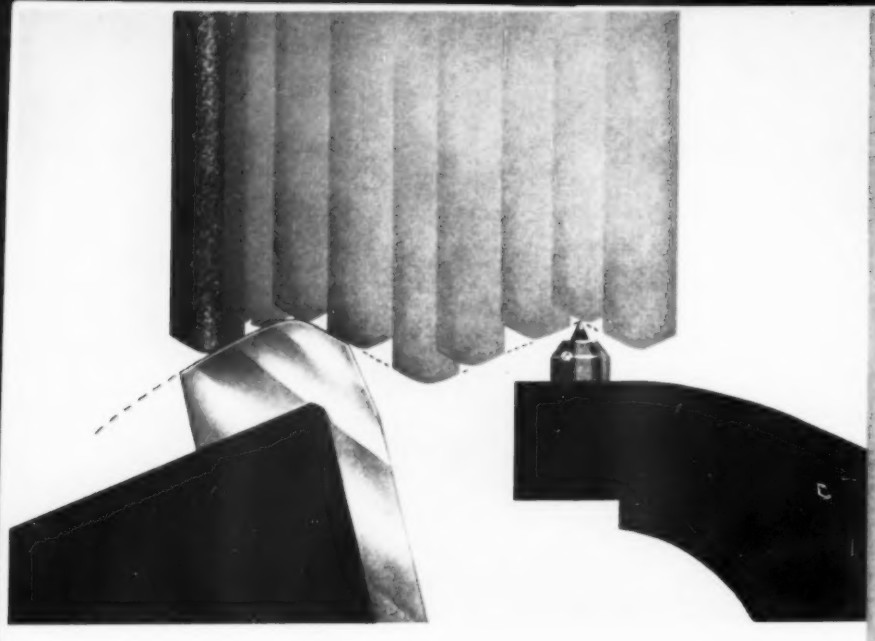
THIS IS REAL Flexibility

NOW... COMPLETELY INTERCHANGEABLE

TO FIT 3 SIZES VERTICAL MACHINES	21 ADJUSTABLE SPINDLE HEADS 27 FIXED SPINDLE HEADS 3 TYPES STANDARD TABLES	TO FIT 3 SIZES HORIZONTAL MACHINES

BAKER®

STANDARD AND SPECIAL DRILLING AND TAPPING MACHINES • COMPRESSION MOLDING MACHINES • AUTOMATIC BAR MACHINES



OLIVER'S FACE MILL GRINDER features automatic wheel dressing with every stroke

The drawing above shows the grinding wheel passing over a cutter tooth after being dressed and formed automatically by a fixed diamond. This happens with each stroke of the Oliver automatic face mill grinder. This exclusive Oliver of Adrian feature permits carbide grinding with a silicon carbide wheel. Automatic feed-down accurately compensates for each dressing thus providing a fixed grinding line which insures a minimum of run-out.

The machine automatically indexes the cutter and controls the tooth shape by a simple cam arrangement so that any practical roughing or finishing form can be obtained. Oliver's face mill grinder is hydraulically operated for smooth, fast (4 to 8 times faster per cutter), accurate and trouble-free performance.

In addition to the automatic machine, Oliver also produces a hand operated, heavy duty machine for all types of face mill grinding on coarse and fine pitch cutters from 4" to 24" in diameter. Still a third machine in this general family is the Oliver No. 2 Arc Radius Cutter Grinder for face mills and cutters requiring a radius on the corner.

Oliver will grind face mills on a "no charge" basis as a demonstration of the ability of the machines. We'd like to work with you—write today.

OLIVER of ADRIAN

1414 E. Maumee St. • Adrian, Michigan

DRILL GRINDERS AND THINNERS–TOOL AND CUTTER GRINDERS–AUTOMATIC AND MANUAL FACE MILL GRINDERS–TOOL BIT GRINDERS–CONTOUR SAWING AND FILING MACHINES

(Advertisement)

A "TRIPLE CHECK" FOR FACE MILLS

To obtain peak performance in your face milling operations you must be certain to achieve (1) maximum cutter life, (2) lowest possible micro-inch reading on the surface being milled and (3) the most economical method of sharpening the cutter.

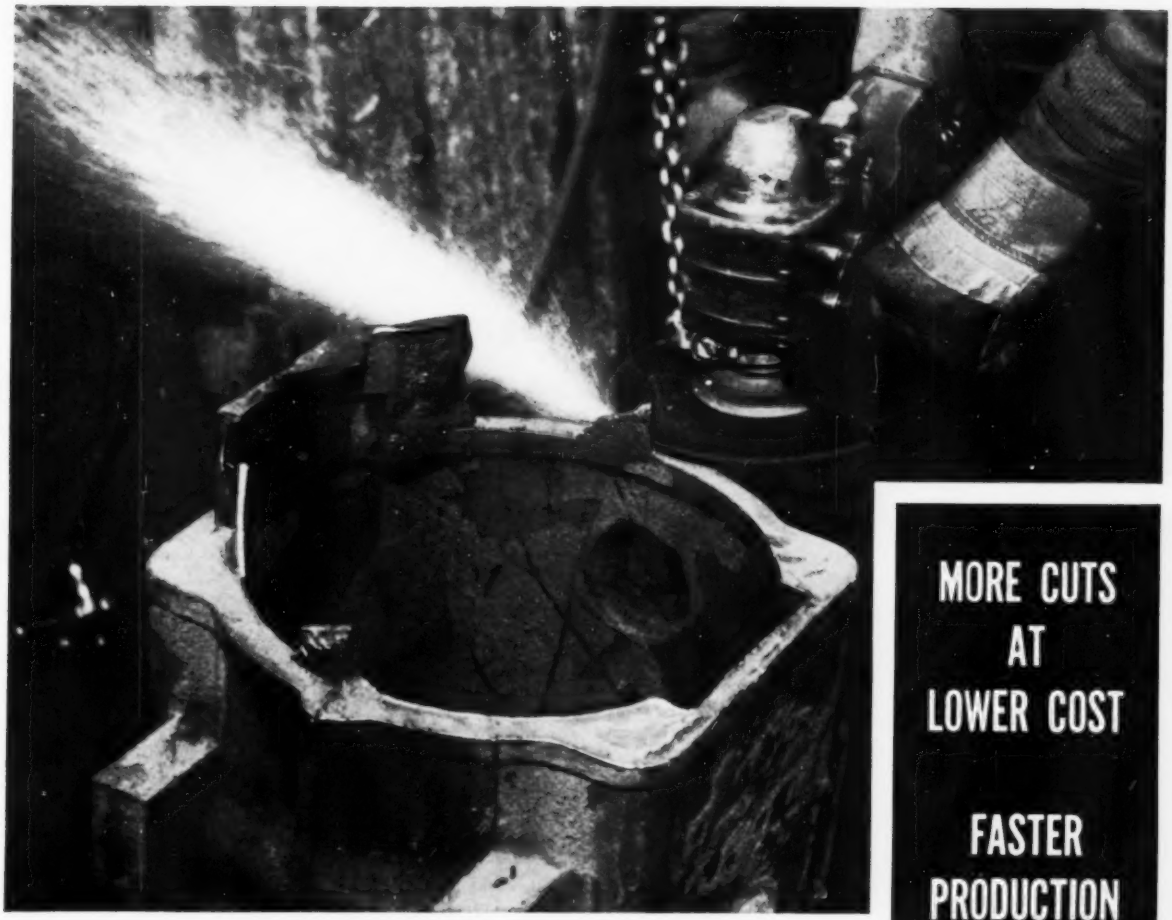
Check your performance to see if you are using all three of the following helpful hints:

1. Maximum cutter life requires the elimination of all sharp corner angles which are normally subject to early breakdown. The Oliver face mill grinder automatically incorporates a corner radius between the face and the lead angle thus correcting this situation. A test grind on your face mill will show a substantial increase in pieces milled per grind.
2. For the finest finish a radius should be used on the face rather than a straight line grind. The face radius

(40" to 100") eliminates the line contact which is largely responsible for the rougher milled surfaces. Standard cams include this feature automatically on the Oliver machine.

3. Minimum grinding costs require the use of fast, automatic machines capable of using semi-skilled operators. The Oliver face mill grinder provides for complete automatic operation, including the indexing as well as the grinding of the lead angle, corner radius, face, dish and the removal of the soft steel backing on carbide tipped cutters. The automatic up-feed of the cutter is an optional feature.

CIRCLE 365 READER SERVICE CARD



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Let a Manhattan sales engineer show you how to increase production efficiency . . . get "More Use Per Dollar" at your shop with Manhattan Reinforced Cut-Off Wheels and other types of Manhattan high speed, heavy duty wheels.

RMD46

GRINDING WHEEL INSTITUTE MEMBER

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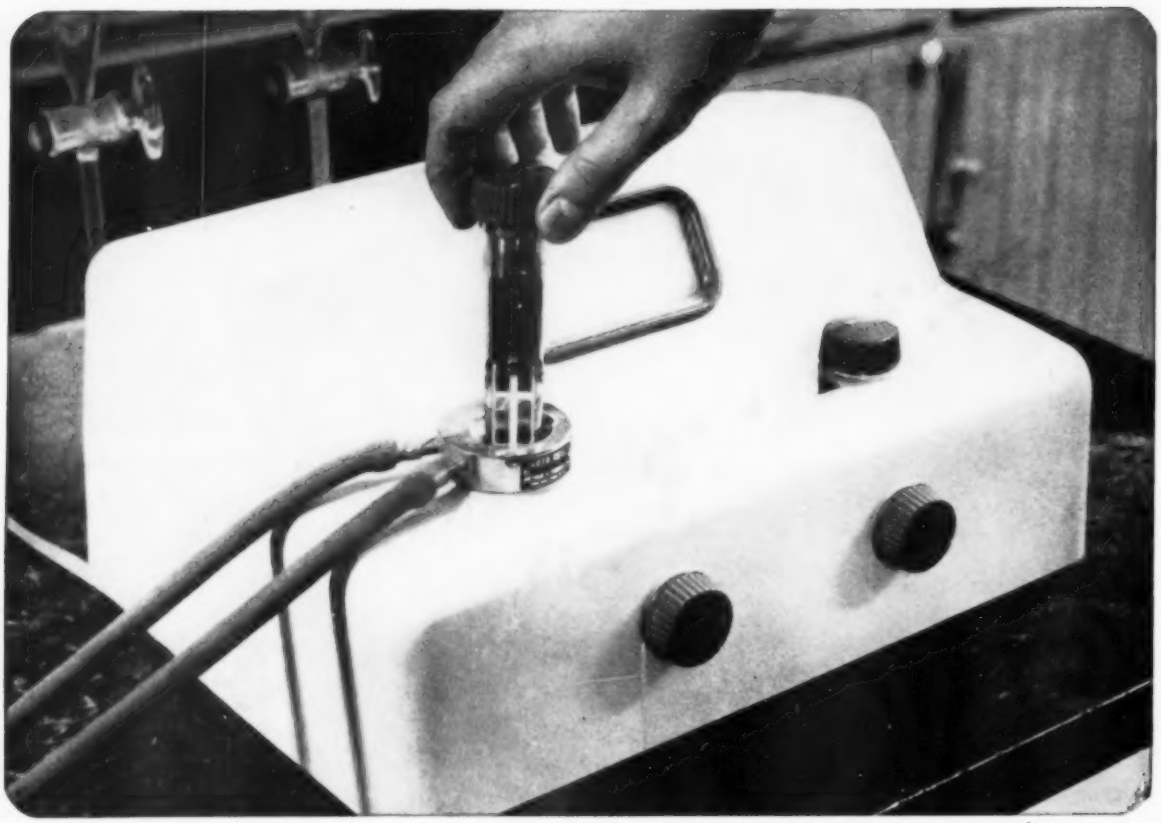
***Experience**—the added alloy in **Allegheny Ludlum** tool steels*



COLORIMETER (inherently extremely accurate) determines percentages of molybdenum, tungsten, cobalt and manganese in A-L tool steel to insure consistent, high quality.

Colorimeter measures exact chemical composition of Allegheny Ludlum tool steel melts

Accurate adjustment of alloys guarantees uniform heat treatment, predictable dimensional changes, reduced grinding, standardized machining operations.

Close control of molybdenum, tungsten, cobalt and manganese is at the heart of a good tool steel melt. In addition to the usual testing methods, Allegheny Ludlum's chemical laboratory checks these metals with Colorimetry because of its inherent, extreme accuracy.

On the basis of the Colorimeter's findings, it is possible to make carefully calculated furnace additions of ferro-alloys, insuring precise control over chemistry. This guarantees your receiving the *exact* analysis order after order, providing *uniformity of heat treatment, predictable dimensional changes, reduced grinding and standardized machining operations.*

WBW-7262

Colorimetry is but one step toward careful control over composition. Allegheny Ludlum also sets exacting purchasing specifications on raw materials and scrap. Quality Control checks all incoming orders to see that they conform with these specifications. Another guard toward your getting your exact specifications: each ingot bears a metal tab showing heat number.

Allegheny Ludlum stocks a complete line of tool steel sizes and grades. Call your nearest A-L representative; you'll get quick service and counsel on such problems as heat treating, machining, grade selection, etc. Or write for A-L's publication list which gives full data on the more than 125 technical publications offered. They'll make your job easier.

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every grade of tool steel... every help in using it

NEW PRODUCT ISSU

Stuart

Productive Lubrication

FOR PROFIT-MINDED PRODUCTION MEN

VOL. 1, NO. 3

MARCH-APRIL 1959

new

Stuart's HI-D* trims hidden costs on grinders at Torrington Bantam Bearing Division

Proves high - detergency grinding fluid can be a flexible cost-reduction tool

This precision roller bearing manufacturer has found out what it takes in a grinding fluid to uncover hidden savings like these:

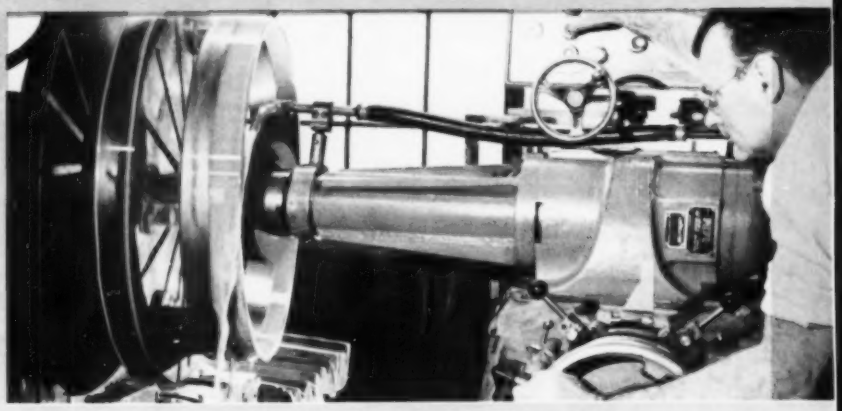
1. Less downtime for wheel dressing and cleaning machines.

2. Longer wheel and diamond life.

The people at The Torrington Company, Bantam Bearing Division, South Bend, Indiana, diligently tested Stuart's new HI-D in a quest for mastery of chips and heat that determine wheel performance and work quality. They put it through its paces against six tough candidates to find the one best fluid for the average condition on 87 grinders—one that would perform most efficiently in their Hoffman flotation-type filter.

We were delighted, but not surprised, when Stuart's HI-D took top honors for both performance and economy. The reason is not too baffling. A new petrochemical detergent in Stuart's HI-D does a yeoman's job of keeping grinding wheels free-cutting. And in our opinion, the use of good "chemical soaps" for washing the fine hair-like chips from between the grits of a grinding wheel is a factor that deserves plenty of appraisal nowadays.

Torrington's efforts paid off. Today, wheels require dressing only ⅓ as often as they used to. Think of the savings from longer wheel and diamond life. But, even deeper benefits result from the elimination and control of downtime for dressing wheels. Wheel change time has been reduced, too, because now Torrington can do both roughing and finishing with a fine grit wheel. Formerly, two wheels had to be used.



On machines like this universal gap grinder, wheels can remove .030" before dressing; whereas, previous coolants made dressing necessary at .010".

Solves chip removal problem

The hoe-and-wheelbarrow method of cleaning swarf from machine tools was abandoned by Torrington years ago. They float their chips and separate them in the central system. Hence, the grinding fluid must foam under proper agitation in the Hoffman flotation filter so chips can be winnowed out in a layer of rich lather. Elimination of chip carry-through is particularly important when grinding fine finishes on 52100, 8660, 4620, and E3310 Krupp, plus different grades of stainless, bronze, and aluminum. Stuart's HI-D proved to be 95% efficient in this respect. Only clean grinding fluid is returned to the machines and line obstructions due to chip precipitation have been avoided.

Reduces grinding fluid cost

Torrington reduced its coolant cost, too. Stuart's HI-D saved ⅓ the cost of the grinding fluid it replaced. The reason is, it stays on the beam at mixtures as lean as 60:1. The less expensive compounds lost their efficiency at anything greater than 40:1.

A three-month try-out on equipment like this proved Stuart's HI-D to be the best of seven grinding compounds tested at Torrington.

The cooling qualities of Stuart's HI-D at 60:1 produced another saving worth mentioning. Bryant "Centalign" grinders, which turn out small and very accurate bearings in the amazing time of 10 to 11 seconds, are hooked into the central system. With the former 16:1 coolant in the machines, the bearings came out hot. But now, with clean abrasive capable of cutting the metal instead of rubbing it, the bearings actually come out cool.

* Formerly: Dasco 102-M-18

MORE PL FACTS ▶

Productive Lubrication

Stuart's HI-D* checks rust, reduces costs at La Salle Steel

new

Stuart's new high-detergency, wide-purpose chemical compound—HI-D—proved to be just what the people at La Salle Steel Company wanted: a cutting fluid that works equally well for grinding or turning, and is capable of inhibiting rust at economically lean mixtures.

During its preliminary evaluation, Stuart's HI-D was put on two Medart turners. We're happy to report (having more than a passing interest in this product) that it made a versatile showing and was immediately put to work on 9 machines in the grinding and turning department. Jobs ranged from roughing cuts of 1/16" to 1/4" on the turners to lighter cuts for accuracy and fine finish on the grinding machines. Which brings up one of the ticklish problems at La Salle . . . in-plant protection for highly finished steel bar stock.

In testing other lubricants, La Salle found bars rusted too readily at dilutions of 30:1. But Stuart's HI-D worked efficiently at a 50:1 dilution while it held its high detergency and lubricity potency for efficient turning and grinding. La Salle maintained quality and at the same time reduced cutting fluid costs plenty (45%).

Stuart's HI-D can be used at 50:1 on machines like this centerless grinder as compared with 15:1 for the previous compound.

If you're looking for a cutting compound that combines high detergency, rust prevention, wide job range, high cooling capacity, and excellent lubricity, it will pay you to call in a Stuart representative. Our real objective is even more direct — buy a drum of Stuart's HI-D and test it on your problem jobs.

* Formerly: Dasco 102-M-18

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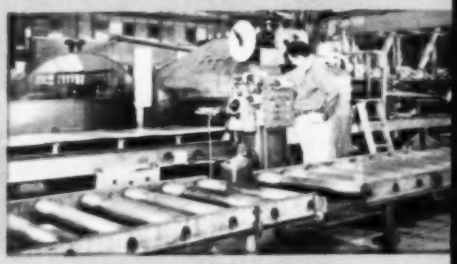


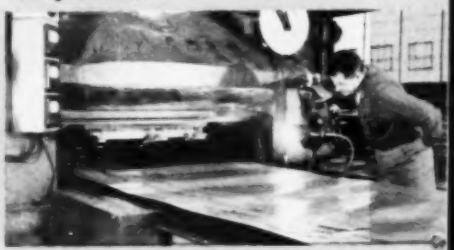
Flexible E.P. Rolling Oil boosts bearing life 50% on Sendzimir cold sheet mill

By using Stuart's Rol-Kleen 6 on their Sendzimir mill, Atlas Steels Limited, Welland, Ontario, stopped bearing failure due to lubricant breakdown — bearing life zoomed 50%.

Pumped from a 1700-gallon pit-installed tank to both bearings and work rolls, Stuart's Rol-Kleen 6 proved to be a real bear in the 21 bearings of the Sendzimir mill. Galling and spawling were eliminated. And yet it has the extra lubricity Atlas needed for rolling top-notch surface finishes on stainless and aircraft super-alloy sheets.

In the three years Atlas has used Stuart's dual-purpose Rol-Kleen 6, no bearing replacements have been traced to a lubricant failure. Reduction in maintenance has been a big factor in helping to control production at a profitable level.

Atlas turns out 2B and 2D finishes as well as light gage No. 4, using an E.P. type lubricant, Stuart's Rol-Kleen 6, for rolling as well as for bearing lubrication.



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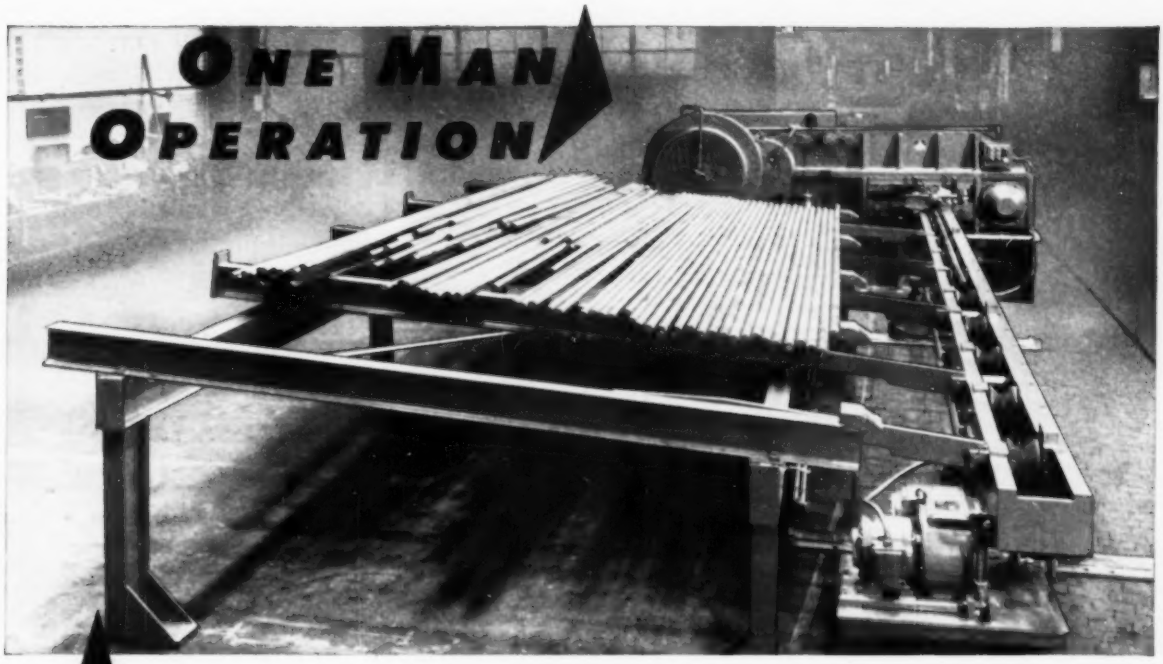
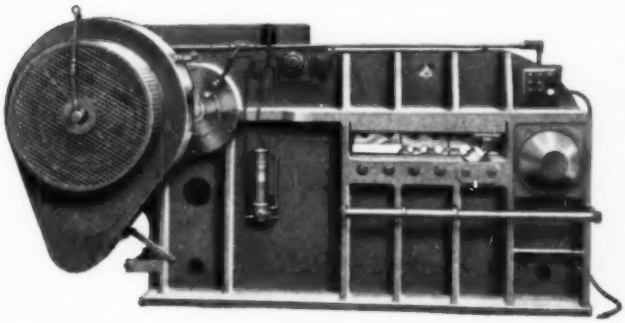


Production cutting of bar stock on a **HILL ACME** *Bar-Billet Shear with auxiliary automatic feed*

The nearest thing to automation achieved so far in the production cutting of bar stock is the HILL ACME BAR-BILLET shear with auxiliary automatic feed. With one man as standby observer, bars are fed automatically from the rack to the roll feed mechanism. Automatic stops on the billet shear predetermine the length of cut.

On ideal installations bars travel from steel storage on conveyors through the billet shear to tote boxes without being touched by hand.

HILL ACME BAR-BILLET shears have proven to be the most efficient, economical and trouble-free units on the market today. With the exclusive outboard support on the drop-off side, square, accurate cuts are assured. These high production shears are built in a variety of sizes to meet every cutting need up to 9″ in rounds. A new bulletin covering all details of construction and operation is now available.



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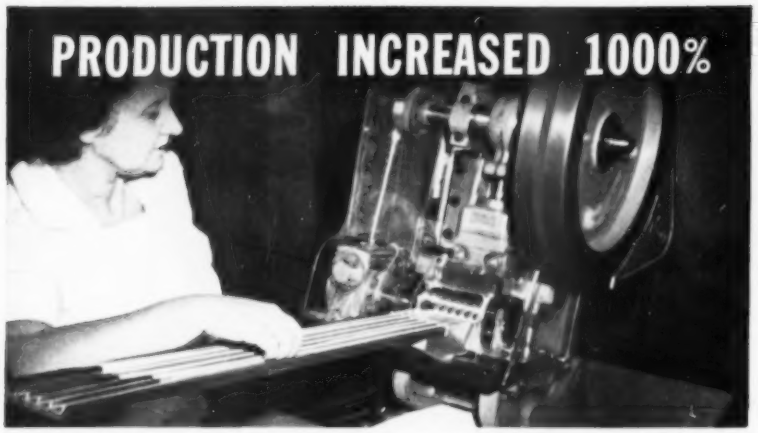

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A leading manufacturer has increased the production of rubber parts from 100,000 parts per shift to 1,000,000 using a 5 Ton Kenco press operating at *500 strokes per minute*.

Six rubber strips are roll fed automatically into the dies and the punched parts are dropped out of the die, six at each stroke, and carried away on a power driven belt conveyor. Production is reckoned on the basis of a six hour run per shift.

The cost of producing this item has been substantially reduced because Kenco Engineering enables this press to sustain production at 500 strokes per minute using adjustable automatic feed. The press is equipped with roller bearings which support the crankshaft, connecting rod and flywheel. Automatic lubrication is used with the result that this Kenco press will operate around the clock at high speeds showing no appreciable wear of the moving parts while permitting maximum life of the dies.

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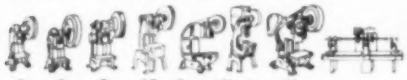

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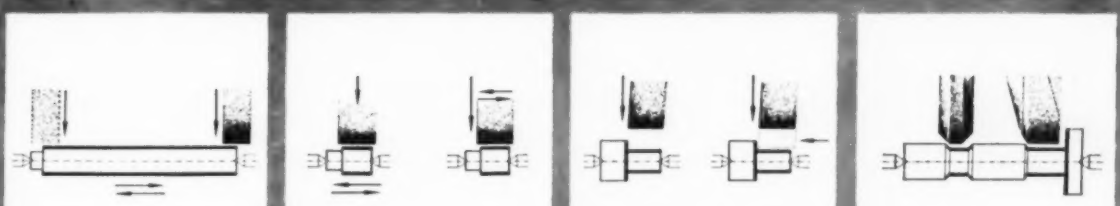

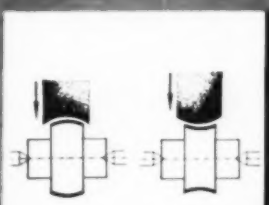

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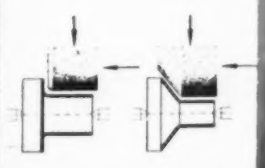

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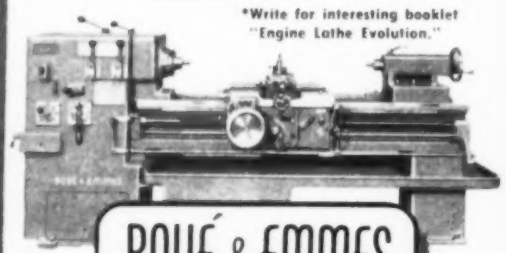

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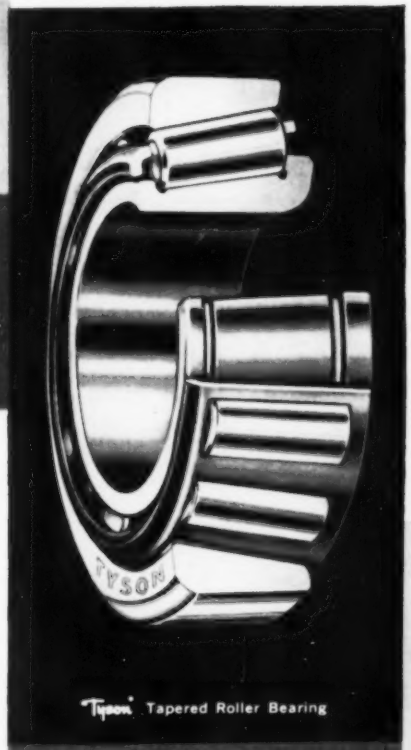
Spherical Roller Bearing

Spherical Roller Thrust Bearing



"Tyson" Tapered Roller Bearing

Single-Row Deep Groove Bearing

Cylindrical Roller Bearing

We regularly produce all of the bearings shown here in a tremendous variety of bores, outside diameters, and widths.

Take just the Tyson tapered roller bearing, for example. We make nearly 1,000 sizes of the single-row, straight bore type alone! Bore sizes range from five-eighths of an inch right up to a precise fourteen inches. And these figures don't include the many other sizes available in our double- and four-row types.

Yet they are all standard SKF *bearings*, promptly available in large quantities at competitive prices.

So, why not get full details on the most complete line in the business? Any of our twenty-five sales offices can quote you facts and figures. Just call the one near you.

5921

Spherical, Cylindrical, Ball, and "Tyson" Tapered Roller Bearings

EVERY TYPE—EVERY USE

SKF®

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®REG. U. S. PAT. OFF.

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FISKE'S FIBRECOOL will help you lower costs through heavier cuts, higher speeds and longer tool life. Produces better finishes in both cutting and grinding. It's "WORK PROVEN".

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METAL WORKING LUBRICANTS

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Plants: Newark 5, N. J. Toledo 5, Ohio

CIRCLE 381 READER SERVICE CARD

USE THIS NEW KIND OF DIAMOND CUT-OFF WHEEL

Gives narrower, smoother cuts on industry's toughest materials

. . . yet prices start at only $32.25

Now . . . at *production prices* . . . DIATRONIC gives you a rim width of .006" that's accurate to a maximum total tolerance of .0005"—or your money back. This accuracy is built in by a new process. No break-in needed. New narrow cut reduces sawdust loss 30%. A must for $3,000-a-pound silicon or germanium crystal. Cuts tungsten carbide, corundum, aluminum oxide, glass . . . practically anything. Stock orders shipped in hours; special wheels available. Write for literature, price list.

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"with built-in tolerance" *TRADEMARK

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CONTOUR GRINDING COSTS with Micromaster

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Visual Grind is manufactured by
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Spur Gears and Pinions

Rigid inspection from first to last insures exact compliance with customer specifications. These 61.274" O.D., 5" F., 56.187" I.D., 108 T., 1¾" C.P. semi-steel ring spur gears and steel spur pinions—8.355" O.D., 5½" F., 13 T., 1¾" C.P., are being given final checks before shipment. Accuracy and prompt delivery are bywords at Stahl Gear. Our estimate will convince you.

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BEVELS TO 54" PD. 1 DP
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CONTINUOUS TOOTH HERRINGBONE TO 60" PD. 2 DP
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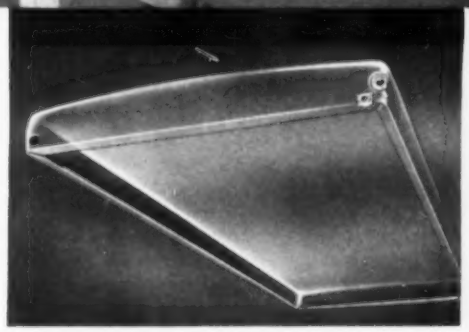
Any size refrigerator doors— the easy way

Another Federal Packaged Production Line goes into action

This latest Federal/Warco Packaged Production Line automatically anneals, embosses, pierces and welds refrigerator door panels of varying sizes, either right- or left-hand, with no change in tooling at a rate of 225 doors per hour.

What's more, this line is unitized . . . stations are put together in sections so the line can be altered to meet design changes in later models. All added parts, such as thimbles and nuts, are fed from hoppers, automatically positioned and welded into place.

If you are making metal products that require several operations, why not ask a Federal/Warco engineer in to show you how a Packaged Production Line can put you in a better competitive position.



Close-up of refrigerator door panel shows operations performed on the line. Right corner is gas annealed and embossed. Three holes are pierced in the piece, and hinge pin retainer and nut stop are automatically welded into exact position.

Federal / Warco
PACKAGED
PRODUCTION LINES

THE FEDERAL MACHINE AND WELDER COMPANY - WARREN, OHIO

AFFILIATED WITH BERKELEY-DAVIS, INC., DANVILLE, ILLINOIS, MANUFACTURERS OF AUTOMATIC ARC WELDING EQUIPMENT.

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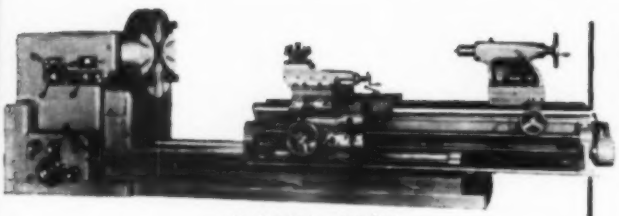
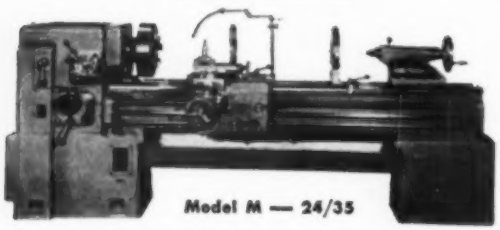
FROM 12" SWING TO 200" SWING
30" CENTERS UP TO 300" CENTERS

THOUSANDS SOLD TO SATISFIED CUSTOMERS!

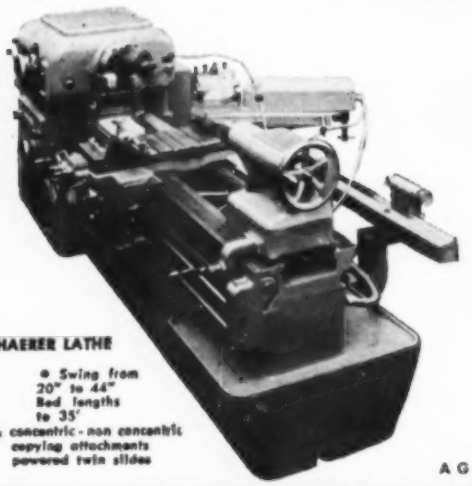
EXTRAORDINARY PRECISION & QUALITY NEW MACHINERY



Model PS —34/62



Model M — 24/35



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- Swing from 20" to 44"
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Flame hardened, ground bed ways.
Heat-hardened gears throughout.
Precision roller spindle bearings.

Sizes in inches	Basic Price
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18x40	$ 3447.
20x40	$ 3647.
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Extra large holes through the spindles up to 13½"

MISSILE LATHES swing up to 100

T LATHES up to 60" swing

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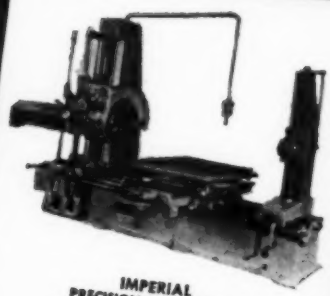

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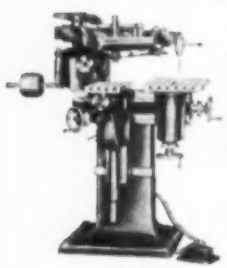

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3 DIMENSIONAL PANTOGRAPH ENGRAVER
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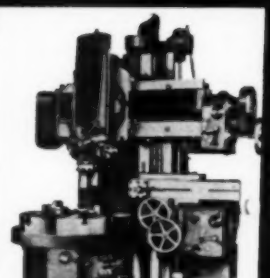

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41"-51" Vertical Turret Lathe $24,985

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SELECT MACHINE TOOLS

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#4 Cincinnati Hi Speed Dial Type Plain Mill, table 78½" x 16¼", 16 speeds to 1800 RPM.
16" x 102" cc LeBlond Hv. Duty G. H. lathe, 12 spindle speeds 15 to 525, late type.
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18" x 40" x 96" centers Norton Type "C" Cylindrical Grinder, two gaps, swing 40" and 28" in gaps, mechanical feed, late type.
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24" x 96" centers Boye & Emmes G.H. Lathe, 12 speeds, timken, late taper.
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6'9" column Fosdick Economax Hydraulic Radial Drill, 20 HP AC mtr. on arm, 36 spindle speeds, hydraulic column clamp, late type.

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Max. gear diameter for hobbing	47"
Vertical travel of hob head slide	23⅝"
Table diameter	33⅝"
Spindle speeds	23-128 r.p.m.
Motor power	9½ H.P.
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Regular price was: $22,500.00
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Delivered anywhere in U.S. plus free assistance for installation

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Listed below are used, surplus new and rebuilt machine tools or services as advertised in this section.

The numbers after the advertiser's name, indicates the products or services offered by the advertiser.

6. Boring Mills
16. Drilling & Reaming Machines
17. Electric Motors
23. Gear Cutting Machines
24. Grinding Machines
29. Lathes
33. Milling Machines
40. Press Brakes
41. Presses
42. Punches
48. Saws
49. Services (Instrument Repair)
50. Shears
51. Shapers

ADVERTISER	PAGE NO.	KEY TO PRODUCTS OR SERVICES
Barer Engineering & Machinery Co., Ltd.	267	23
Cincinnati Machinery Co.	267	6, 16, 24, 29, 33, 51
Eastern Machinery Co., The	268	6, 29, 33, 41, 42, 48, 50
Electric Equipment Co.	268	17
Hyman & Sons, Joseph	267	40, 41, 50
National Machinery Exchange	267	41
Union Dale Precision Repair Serv. Co.	268	49
FS-1184	268	41

SEARCHLIGHT Equipment Locating SERVICE

"No Cost or Obligation"

This service is aimed at helping you, the reader of "SEARCHLIGHT," to locate rebuilt and used machine tools and equipment. Not currently advertised. (This service is for USER-BUYERS only) No charge or obligation.

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Classified Advertising Division, P.O. Box 12, N. Y. 36, N. Y.

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STREET .....

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3/23/59

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THE SIGN OF QUALITY — THE MARK OF DEPENDABILITY

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4 spindle 360° Cincinnati Automatic, m.d., 1944

50" capacity 2 spindle Pratt & Whitney Vertical Miller & Profiler, Model 1482

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No. 5 Hilles & Jones Punch & Shear, single end, type "G"

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No. 47 Hendley & Whittemore Co. Alligator Type Bar Cutter & Shear

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No. 3 Niles-Bement-Pond Axle Lathe, center drive type

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No. 4XB Robertson Economy, m.d., new

No. 32B Cochran Bly Saw, m.d., latest

Model 102, Type JCAW, Cincinnati Elec. Tool & Abrasive Cut-off, m.d.

Model 401 Cutomatic Abrasive Cut-off, m.d.

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with latest U.S., European equipment accepts contract work faverable rates. 20 lathes up 13', 2 millers, 2 planers up 11½', working length, shaper 24" stroke, 6 gear hobbers for spur, helical worm gears 1 to 72". 2 bevel gear GLEASONS up 12" diameter. 2 FELLOWS. Request detailed information.

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With heavy tonnage—large bed presses. Send full particulars

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EMPLOYMENT OPPORTUNITIES

V. P. OF SALES

Well established machinery manufacturer has need of a sales executive to direct sales functions and customer relations, and to participate in related matters such as product development and pricing. Best experience would be in shoe machinery or shoe manufacturing as Superintendent or Sales Manager, with past sales engineering experience. Must be engineering and cost minded, able to analyze customer requirements and cost improvements. Background in comparable high production machinery also considered. Engineering or accounting training desired. Excellent growth potential. Age 40-45. Substantial salary, bonus, and stock option plan. Your reply invited in complete confidence.

P-1224 AMERICAN MACHINIST
520 N. Michigan Avenue, Chicago 11, Illinois

SCREW MACHINE FOREMAN

Growth opportunity for young man to head up a small, but expanding Screw Machine Department with 50 year old firm.

You will work in a clean, modern factory in Northern New Jersey with brand new B&S automatics and second operation machines, manufacturing a wide variety of screw machine parts 00 thru #2 x 1½.

We expect you to have thorough knowledge of B&S automatic set-up, operation, and maintenance. Successful supervisory record desirable; however, if you've had no supervisory experience you must have understanding of how to handle men and a desire to learn proper supervisory methods.

This is an outstanding opportunity for a man looking to the future to get in on the ground floor and grow with a well established yet aggressive organization.

Reply in confidence stating fully experience, salary requirements, and reasons why you personally feel qualified to handle this job.

P-1062 AMERICAN MACHINIST
CLASS. ADV. DIV., P.O. BOX 12, N. Y. 36

PLANT SUPERINTENDENT

Precision machinery manufacturer needs superintendent with 10 or more years experience in metal machining. Must have extensive knowledge of machine tools and equipment, know automatic screw machines including operation, set-up, and tooling. Must be able to lower costs using available engineering, tooling, and production planning. AGE to 45. Challenging position, southern location. Write giving complete details of background.

P-1102, AMERICAN MACHINIST
Class. Adv. Div., P.O. Box 12, N.Y. 36

Watch—

the *Searchlight Section* for

Equipment

and Employment Opportunities

INDEX TO ADVERTISERS

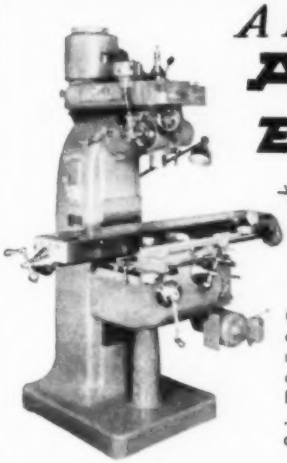
This index is published as a convenience to the readers. Every care is taken to make it accurate, but AMERICAN MACHINIST assumes no responsibility for errors or omissions.

	Page
Aaron Machinery Company, Inc.	266
Abrasive Products, Inc.	245
Air Reduction Sales Company Division of Air Reduction Inc.	247
Allegheny Ludlum Steel Corp.	256
Allen-Bradley Company	85-86
Allen Mfg. Company	190
American Chain Division American Chain & Cable Co., Inc.	73
American Smelting & Refining Co.	249-252
American Steel & Wire	37
American Steel Foundries King Machine Tool Division	207
American Tool Works Co.	121
Amplex Div. Chrysler Corp.	274
Armco Steel Corporation	122
Armstrong Blum Mfg. Co.	52
Armstrong Brothers Tool Company	60
Associated Spring Corp.	212-213
Atkins Saw Division Borg-Warner Corporation	68
Atrax Company	220
Baird Machine Company	226
Baker Bros. Inc.	253
Baldwin-Lima-Hamilton Corp. Hamilton Division	219
Bath & Co., Inc., John	232
Baush Machine Tool Co.	203
Behr-Manning Corp.	31
Bethlehem Steel Company	231
Bliss & Laughlin Inc.	227
Bliss Company, E. W.	156
Boye & Emmes Machine Tool Co.	262
Briney Mfg. Co.	270
Brown & Sharpe Mfg. Co.	99
Buhr Machine Tool Co.	103-106
Bullard Co.	45
Bunting Brass & Bronze Co.	229
Burg Tool Mfg. Company Inc.	46-47
Cadillac Gage Company	44
Capewell Mfg. Co.	98
Card Division, S. W. Union Twist Drill Company	80
Carlton Machine Tool Company	87
Carpenter Steel Company	61
Challenge Machinery Company	237
Chambersburg Engineering Co.	198
Chicago-Latrobe Company	63

(Continued on page 270)

A Lot More **POWER**

A Lot More **ACCURACY** *ECONOMY too!*



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● 1½ HP Head or optional 2 HP with continuous duty motor gives 50% or more capacity . . . More rigidity, more accuracy . . . Increased horse power and dynamically balanced Cast Iron Pulleys and Drive System afford improved production capacity . . . More weight in the column, heavier ribbed column, heavier knee, heavier saddle.

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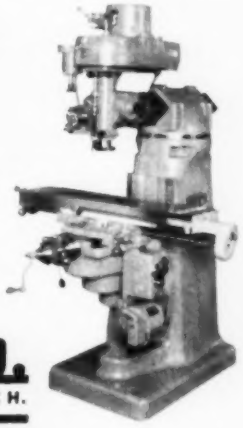

INDEX MACHINE CO.

547 N. MECHANIC ST., JACKSON, MICH.

CIRCLE 387 READER SERVICE CARD

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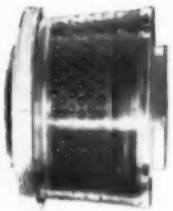

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INDEX TO ADVERTISERS

(Continued from page 269)

	Page
Cincinnati Gilbert Machine Tool Co.	88
Cincinnati Milling Machine Co. Cincinnati Milling Products Div.	79
Cincinnati Milling Machine Co. Grinding Machine Division	6-7
Cincinnati Shaper Company	30
Cleveland Automatic Machine Co.	118
Cleveland Grinding Machine Co.	264
Cogsdill Twist Drill Co., Inc.	3rd Cover
Columbia-Geneva Steel	37
Columbus Die-Tool & Machine Co.	246
Convair, A Div. of General Dynamics Corp.	210
Copperweld Steel Company	160
Cushman Chuck Company	114
Delta File Works Inc.	248
Devcon Corporation	218
DeVlieg Machine Company	22-23
Disston, Division H. K. Porter Company, Inc.	234
Dreis & Krump Manufacturing Co.	233
Dykem Company	262
Eastman Kodak Co. Special Products Sales	209
Eisler Engineering Co., Inc.	262
Elgin National Watch Co. Abrasives Div.	224
Ex-Cell-O Corporation	69, 112
Fafnir Bearing Company	89
Famco Machine Company	272
Federal Machine & Welder Co.	265
Federal Products Corporation	42-43
Fellows Gear Shaper Company	8-9
Felters Company	211
Fiske Brothers Refining Co.	264
Floridin Company	218
Fosdick Machine Tool Company	92
Frauenthal Division Kaydon Engineering Corp.	200-201
Gardner Machine Co.	25
Geometric-Horton	179-180
Gisholt Machine Company	33-36
Goss & de Leeuw Machine Company	236
Gray Company, G. A.	28-29
Greenfield Tap & Die Corporation	179-180
Grieder Industries	262
Gulf Oil Corporation	50-51
Hamilton Division Baldwin-Lima-Hamilton Corp.	219
Hamilton Tool Company	273
Hanson Whitney Co.	271
Hardinge Brothers, Inc.	95

INDEX TO ADVERTISERS

	Page
Hayes, Inc., C. I.	188
Heald Machine Co. Sub. Cincinnati Milling Machine Co.	2nd Cover
Hill Acme Company Acme Machine Div.	259
Index Machine Co.	269
Ingersoll Kalamazoo Division Borg-Warner Corp.	222
Ingersoll Milling Machine Co.	191
Ingersoll-Rand Company	214
Innocenti	56-57
Jacobs Mfg. Co.	70-71
Johnson Bronze Company Sub. Apex Bronze Foundry Co.	192
Jones & Lamson Machine Co.	78
Jones & Laughlin Steel Corp.	239
Kenco Mfg. Co.	260
Kent-Owens Machine Company	158
King Machine Tool Div. American Steel Foundries	207
Kingsbury Machine Tool Corp.	64
Landis Machine Company	10-11
Landis Tool Company	12-13
Lange Engineering, Erich	208
LeBlond Machine Tool Co., R. K.	96-97
Le Maire Machine Tool Co.	185
Lilly & Co., Eli Agricultural & Industrial Pdts. Div.	32
Linley Brothers Co.	273
Lodge & Shipley Company	124
M. B. I. Export & Import Ltd.	217
Magnathermic Corporation	175
Mahon Company, R. C.	65
Manhattan Rubber Div. Raybestos-Manhattan, Inc.	255
Meehanite Metal Corp.	194-195
Metallurgical Products Dept., General Electric Company	116
Micromatic Hone Corp.	204-205
Micrometrical Mfg. Co.	199
Minnesota Mining & Mfg. Co.	223
Minster Machine Co.	228
Moline Tool Company	240
Monarch Machine Tool Company	93
Moore Special Tool Co., Inc.	90-91
Motch & Merryweather Machinery Company	20-21
National Acme Company	76-77
National Broach & Machine Co.	162

(Continued on page 272)

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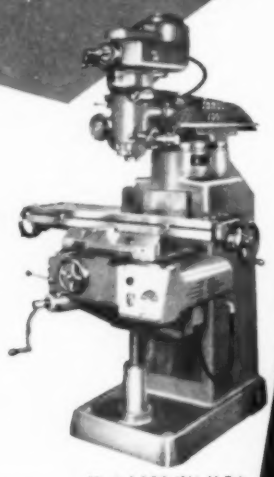

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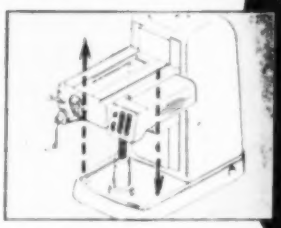

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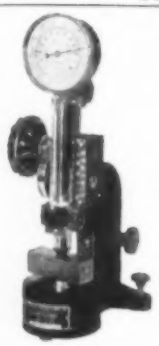

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INDEX TO ADVERTISERS

(Continued from page 271)

	Page
National Machine Tool Company	240
Navan Products Inc.	264
New Britain Machine Company New Britain Gridley Machine Div.	53, 54
New Jersey Zinc Company	24
Niagara Machine & Tool Works	49
Noble & Westbrook Mfg. Co.	100
North American Aviation Inc.	264
Norton Company	18-19, 59
Nutap	208
Oliver Instrument Company	254
Olivetti Corporation of America	261
Olofsson Corporation	189
Orban Co., Inc., Kurt	173
Pacific Industrial Mfg. Company	55
Perfection Gear Co. American Stock Gear Div.	196
Pipe Machinery Company	244
Pratt & Whitney Co., Inc.	38-41
Precise Products Corp.	230
Producto Machine Co.	241
Raybestos-Manhattan Inc.	255
Raytheon Mfg. Co.	238
Reed Rolled Thread Die Company	101
Republic Steel Corp.	74-75
Ruthman Machinery Company	206
S. K. F. Industries Inc.	263
Sales Service Mfg. Co.	208
Scherr Co., Inc., George	269
Sheffield Corp. of Bendix Aviation	94
Shepard Niles Crane & Hoist Corp.	193
Shore Instrument & Mfg. Co., Inc.	272
Simonds Abrasive Co.	108
Sinclair Refining Co.	181
Snyder Corporation	110
Socony Mobil Oil Co., Inc. and Affiliates	66-67
Springfield Machine Tool Co.	235
Square D Company	221
Stahl Gear & Machine Company	264
Standard Oil Co. (Indiana)	26-27
Stuart Oil Co., Ltd., D. A.	257-258
Sun Oil Co.	197
Superior Steel Products Corp.	58
Supreme Products Corp.	62
Tennessee Coal & Iron	37
Texas Co.	5
Textile Machine Works	183

INDEX TO ADVERTISERS

	Page
Timken Roller Bearing Co. Industrial Division	4th Cover
Tomkins-Johnson Company	155
Torit Manufacturing Company	202
Union Twist Drill Company	81
United States Drill Head Co.	242
United States Steel Corp.	37
United States Steel Export Co.	37
United States Steel Supply	37
Universal Cyclops Steel Corp.	102
Van Norman Machine Co. Div. Van Norman Industries, Inc.	14-15
Walker Co., Inc., O. S.	72
Warner & Swasey Company	16-17
Waterbury Farrel Foundry & Machine Co.	84
Wesson Co.	215-216
Whitman & Barnes Inc.	225
Wiedemann Machine Co.	187
Williams & Co., J. H. Div. of United-Greenfield Corp.	48
Yoder Company	222
Youngstown Sheet & Tube Company	177

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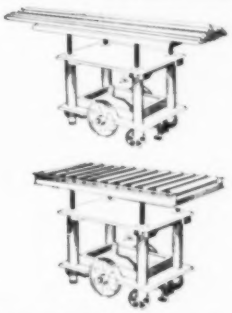

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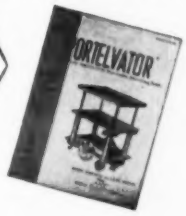

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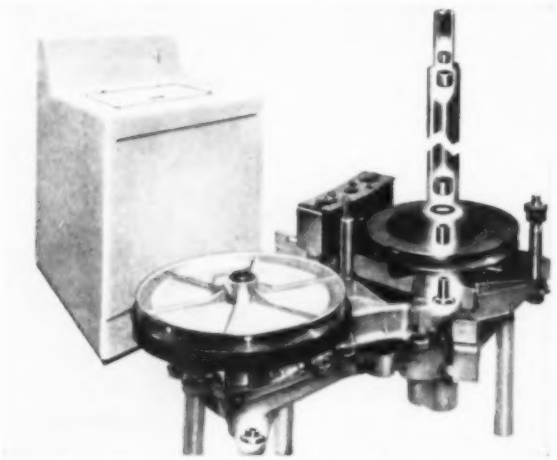

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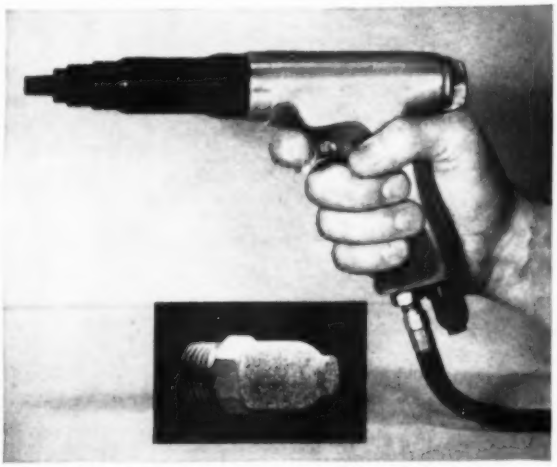

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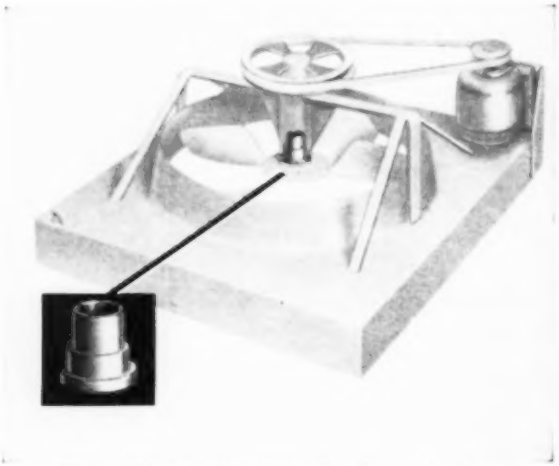

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1	23	45	67	89	111	133	155	177	199	221	243	265	287	309	331	353	375	397	419	441
2	24	46	68	90	112	134	156	178	200	222	244	266	288	310	332	354	376	398	420	442
3	25	47	69	91	113	135	157	179	201	223	245	267	289	311	333	355	377	399	421	443
4	26	48	70	92	114	136	158	180	202	224	246	268	290	312	334	356	378	400	422	444
5	27	49	71	93	115	137	159	181	203	225	247	269	291	313	335	357	379	401	423	445
6	28	50	72	94	116	138	160	182	204	226	248	270	292	314	336	358	380	402	424	446
7	29	51	73	95	117	139	161	183	205	227	249	271	293	315	337	359	381	403	425	447
8	30	52	74	96	118	140	162	184	206	228	250	272	294	316	338	360	382	404	426	448
9	31	53	75	97	119	141	163	185	207	229	251	273	295	317	339	361	383	405	427	449
10	32	54	76	98	120	142	164	186	208	230	252	274	296	318	340	362	384	406	428	450
11	33	55	77	99	121	143	165	187	209	231	253	275	297	319	341	363	385	407	429	451
12	34	56	78	100	122	144	166	188	210	232	254	276	298	320	342	364	386	408	430	452
13	35	57	79	101	123	145	167	189	211	233	255	277	299	321	343	365	387	409	431	453
14	36	58	80	102	124	146	168	190	212	234	256	278	300	322	344	366	388	410	432	454
15	37	59	81	103	125	147	169	191	213	235	257	279	301	323	345	367	389	411	433	455
16	38	60	82	104	126	148	170	192	214	236	258	280	302	324	346	368	390	412	434	456
17	39	61	83	105	127	149	171	193	215	237	259	281	303	325	347	369	391	413	435	457
18	40	62	84	106	128	150	172	194	216	238	260	282	304	326	348	370	392	414	436	458
19	41	63	85	107	129	151	173	195	217	239	261	283	305	327	349	371	393	415	437	459
20	42	64	86	108	130	152	174	196	218	240	262	284	306	328	350	372	394	416	438	460
21	43	65	87	109	131	153	175	197	219	241	263	285	307	329	351	373	395	417	439	461
22	44	66	88	110	132	154	176	198	220	242	264	286	308	330	352	374	396	418	440	462

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